ICC-ES Evaluation Report

ESR-3982

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This report remains under an active continuous compliance program through the end of September 2027

This report also contains:

- **City of LA Supplement**
- **CA Supplement**
- **FL Supplement w/ HVHZ**

DIVISION: 31 00 00 — EARTHWORK Section: 31 63 00 — Bored Piles	REPORT HOLDER: HELICAL ANCHORS, INC. ADDITIONAL LISTEE: BHUJ POLYMERS PRIVATE LIMITED	EVALUATION SUBJECT: HELICAL ANCHORS HELICAL FOUNDATION SYSTEMS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2024, 2021, 2018, and 2015 *International Building Code®* (IBC)
- 2024, 2021, 2018, and 2015 *International Residential Code®* (IRC)

Properties evaluated:

Structural and geotechnical

2.0 USES

2.1 IBC:

The Helical Anchors' helical 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, tension, and lateral 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 only compression loads. Deep foundations for new construction are generally obtained by attaching the helical piles to new construction brackets that are bedded in concrete pile caps, footings, or grade beams, which support compression, tension, and lateral loads.

2.2 IRC:

Under the IRC, the Helical Anchors' helical foundation systems may be used as an alternative foundation system supporting light-frame construction, exterior porch deck, elevated walkway and stairway construction and accessory structures.

3.0 DESCRIPTION

3.1 General:

The Helical Anchors' helical foundation systems consist of a lead shaft section with one or more helical-shaped steel bearing plates (or helices), extension shaft section(s), couplings that connect multiple shaft sections, and a bracket that allows for attachment to the supported structures. The shafts with helix bearing plates are screwed into the ground by application of torsion and the shaft is extended until a desired depth or a suitable soil or bedrock bearing stratum is reached. The bracket is then installed to connect the pile to the concrete foundation of the supported structure. The Helical Anchors' helical foundation systems are available in two sizes: $2^{7}/_{8}$x0.203-inch and $2^{7}/_{8}$x0.217-inch (73x5.15 mm and 73x5.5 mm, respectively).

3.2 System Components:

3.2.1 Helical Piles: The Helical Anchors' helical pile lead shaft sections consist of one or more (up to three) helical-shaped circular steel plates factory-welded to the lead steel shaft. The extension shaft sections have shafts similar to the lead shaft sections, except without the helical plates. The depth of the helical piles in soil is typically extended by adding one or more steel shaft extensions that are mechanically connected together by couplers to form one continuous steel pile.

The shaft lead sections, and extension sections consist of a $2^{7}/_{8}$-inch-outside-diameter (73 mm) round hollow steel tubing having a minimum wall thickness of 0.203 or 0.217 inch (5.15 or 5.5 mm, respectively).

Each helical steel bearing plate (helix) is $^{3}/_{8}$ inch (9.5 mm) thick and has spiral edge geometry with an outer diameter of 8, 10, 12 or 14-inches (203, 254, 305 or 356 mm). The helix plates are pressed to form a 3-inch (76.2 mm) pitch, which is the distance between the leading and trailing edges. The lead helix is located near the tip (bottom end) of the shaft lead section. For multiple helix installation, the helical bearing plates are spaced three times the diameter of the lowest plate apart starting at the toe of the lead section. Typically, the smallest diameter helical bearing plate is placed near the tip (bottom) of the lead section and the largest diameter helical bearing plate is placed nearest the top (trailing end) of the lead section or on an extension section.

The helical pile lead shaft sections and extension sections are connected together by a bolted pin-box coupling system. The coupler pin consists of a round solid steel bar (Figure 3). The coupler box consists of a $2^{7}/_{8}$-inch-outside-diameter (73 mm) round hollow steel tubing (Figure 3). Each extension section consists of a pin coupler and a box coupler which are inertia-friction welded, in the factory, to the opposing extension ends. Each lead shaft section consists of a box coupler that is inertia-friction welded, in the factory, to the top end of the lead shaft. Connection of extension sections to the lead shaft or other extension sections is made by through-bolted connections with $^{3}/_{4}$-inch-diameter (19 mm) steel bolts through the extension section coupling pin and the connected lead or other extensions coupling box. Three bolts are intended for the coupler in $2^{7}/_{8}$x0.217 inch helical piles, while two bolts are intended for the coupler in $2^{7}/_{8}$x0.203 inch helical piles. Figure 3 illustrates the coupling pin and box connections.

Leads and extensions may be either bare steel or hot-dipped galvanized in accordance with ASTM A123.

3.2.2 Brackets: Brackets are constructed from steel plate and steel pipe components, which are factory-welded together. The different brackets are described in Sections 3.2.2.1 through 3.2.2.3. All brackets may be either bare steel or hot-dipped galvanized in accordance with ASTM A123.

3.2.2.1 Type A Side Load Bracket SLB: This bracket is used with the $2^{7}/_{8}$x0.217-inch (73 mm outside diameter and 5.51 mm wall thickness) helical pile to support existing concrete foundations by transferring axial compressive loads from the existing foundations to the helical pile. The bracket seat is constructed of a $^{5}/_{16}$-inch-thick (8 mm) steel plate bent to a 90-degree angle seat measuring 14 inches (356 mm) wide by 7.69 inches (195 mm) long on the horizontal leg and 6.53 inches (166 mm) on the vertical leg. The bracket seat is factory-welded to other steel plates to form the bracket main body. Among the steel plates the seat is welded to, there are two steel vertical side plates that form the external guide sleeve for the bracket. See Figure 2 of this report. The $2^{7}/_{8}$x0.217-inch pile shaft is inserted through the external guide sleeve. Once the pile shaft has been installed through the external guide sleeve, the pile is cut approximately 6 inches (152 mm) above the bracket. One $^{5}/_{8}$-inch-diameter (15.8 mm) heavy hex bolt with a matching nut is installed to the steel vertical side plates to confine the pile shaft. A lifting T-pipe consists of a 1.75-in (44 mm) round corner square top bar and a1.66-inch-outside-diameter (42 mm) round steel tubing having a nominal wall thickness of 0.313-inch (8 mm) and a length of 18 inches (457 mm). The lifting T-bracket is connected to the bracket main body with two $^{7}/_{8}$-inch-diameter steel threaded rods, four matching standard hex nuts, and matching steel washers. See Figure 2 of this report.

3.2.2.2 Type A Side Load Bracket SLB50: This bracket is used with the $2^{7}/_{8}$x0.203-inch (73 mm outside diameter and 5.16 mm wall thickness) helical pile to support existing concrete foundations by transferring axial compressive loads from the existing foundations to the helical pile. The bracket seat is constructed of a $^{3}/_{8}$-inch-thick (9.53 mm) steel plate bent to a 90-degree angle seat measuring 10.5 inches (267 mm) wide by 8.375 inches (213 mm) long on the horizontal leg and 6.375 inches (162 mm) on the vertical leg. The bracket seat is factory-welded to other steel plates to form the bracket main body. See Figure 2 for bracket details. The $2^{7}/_{8}$x0.203-inch pile shaft is inserted through the bracket's guide sleeve. Once the pile shaft has been installed through the bracket's guide sleeve, the pile is cut approximately 6 inches (152 mm) above the bracket. A bracket cap is secured above the pile shaft and attached to the bracket with two $^3/_4$ x 16-inch (19.05 x 406 mm) lifting steel threaded rods, four matching nuts (two for each rod) and two matching steel washers. The nuts are $^3/_4$-10 heavy hex or $^3/_4$-4.5 heavy coil nuts.

3.2.2.3 Type B Direct Load Brackets: These brackets are used with the helical pile system in new construction where the steel bearing plate of the bracket is cast into new concrete grade beams, footings, or pile caps. The brackets can transfer compression, tension and lateral loads between the pile and the concrete foundation, See Tables 2A and 2B. For requirements of concrete cover and end/edge distance refer to Table 2C. The brackets come in two configurations as shown in Figure 1. The bracket consists of a square bearing plate factory-welded to a round $3^1/_2$-inch-outside-diameter (89mm) round hollow steel tubing, having a nominal wall thickness of 0.254-inch. The bracket is attached to the shaft in the field with ¾-inch (19 mm) standard hex bolts with matching ¾-inch (19 mm) standard hex nuts. See Tables 2A and 2B for information on number of required bolts.

3.3 Material Specifications:

3.3.1 Helix Plates: The $^3/_8$-inch-thick helix plates have an outer diameter of 8, 10, 12, or 14 inches (203, 254, 305 or 356 mm) which are made from carbon steel plates conforming to ASTM A572 or similar and having a minimum yield strength of 50,000 psi (345 MPa) and a minimum tensile strength of 65,000 psi (448 MPa). The helix plates are factory-welded to the shafts and are either bare steel or hot-dipped galvanized in accordance with ASTM A123.

3.3.2 Helical Pile Lead Shafts and Extensions: The lead shafts and extensions of the TS278217 helical pile ($2^7/_8$ x 0.217 inch) are round hollow steel tubes that conform to API-5CT N80 and having a minimum yield strength of 80,000 psi (551 MPa) and a minimum tensile strength of 100,000 psi (689 MPa). The lead shafts and extensions of the TS278203 helical pile ($2^7/_8$ x 0.203 inch) are round hollow steel tubes that conform to ASTM A1011 SS Gr 50 and EN10219-1 Gr S355JOH with a minimum yield strength of 51,488 psi (355 MPa) and a minimum tensile strength of 73,969 psi (510 MPa). The lead shafts and extensions may be either bare steel or hot-dipped galvanized in accordance with ASTM A123.

3.3.3 Shaft Pin and Box Couplers: The shaft pin and box couplers are round hollow steel tubes. The pin couplers of TS278217 helical piles ($2^7/_8$ x 0.217 inch) conform to AISI C4140 or EN-19, having a minimum yield strength of 107,000 psi (738 MPa) and a minimum tensile strength of 130,000 psi (896 MPa). The box couplers of TS278217 helical piles ($2^7/_8$ x 0.217 inch) conform to SAE 1527 and must have a minimum yield strength of 107,000 psi (738 MPa) and a minimum tensile strength of 130,000 psi (896 MPa). The pin couplers of TS278203 helical piles ($2^7/_8$ x 0.203 inch) conform to EN-8D, having a minimum yield strength of 49,312 psi (340 MPa) and a minimum tensile strength of 90,000 psi (621 MPa). The box couplers of TS278203 helical piles ($2^7/_8$ x 0.203 inch) conform to ASTM A1011 SS Gr 50 and EN10219-1 Gr S355JOH with a minimum yield strength of 51,488 psi (355 MPa) and a minimum tensile strength of 73,969 psi (510 MPa). The shaft pin and box couplers are inertia-friction welded, in the factory, to shaft leads and extensions. The couplers may be either bare steel or hot-dipped galvanized in accordance with ASTM A123.

3.3.4 Type A Side Load Brackets:

3.3.4.1 SDB Bracket: The plates used to fabricate SDB bracket main body conform to ASTM A36 or similar, having a minimum yield strength of 36,000 psi (248 MPa) and a minimum tensile strength of 58,000 psi (400 MPa). The round corner square top bar which is part of the lifting T-pipe is made from steel conforming to ASTM A500 Gr. B, except for 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 a part of the lifting T-pipe is made from steel conforming 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 steel bolts and full threaded rods conform to either ASTM F3125 Grade A325 or SAE J429 Grade 5, having a minimum tensile strength of 120,000 psi (827 MPa). SAE J995 Grade 5 nuts and ASTM F436 washers are used to fasten the treaded rods to the bracket. SDB bracket may be either bare steel or hot-dipped galvanized in accordance with ASTM A123.

3.3.4.2 SDB50 Bracket: The plates used to fabricate SDB50 bracket main body 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 bracket cap, which is part of the lifting mechanism, is made from steel conforming to ASTM A572 Gr. 50, with a minimum yield strength of 50,763 psi (350 MPa) and a minimum tensile strength of 71,069 psi (490 MPa). The round steel tubing in SDB50 bracket is made from steel conforming to ASTM A1011 SS Gr 55 and SAE 1541 with a minimum yield strength of 55,000 psi (380 MPa) and a minimum tensile strength of 80,000 psi (550 MPa). The threaded rods of lifting mechanism conform to either ASTM A193 Grade B7 (3/4 inch-10 unc) with minimum yield strength of 105 KSI and minimum tensile strength of 125 KSI or ASTM

A108 Gr 1045 ($^3/_4$ inch 4.5 coil rod) with minimum yield strength of 69,750 PSI (481 MPa) and minimum tensile strength of 96,550 PSI (666 MPa). The matching nuts are ¾-10 Heavy Hex nuts meeting ASTM A193 requirements or ¾ inch-4.5 heavy coil nuts meeting ASTM A1035 requirements, respectively. The washers meet ASTM F436 Type 1. SDB bracket may be either bare steel or hot-dipped galvanized in accordance with ASTM A123.

3.3.5 Type B Direct Load Brackets: Components materials of different Type B brackets are included in Figure 1. When required, the bolts connecting the Type B brackets to the shaft or extension must comply with Section 3.3.6 of this report. Type B brackets are made from either bare steel or hot-dipped galvanized in accordance with ASTM A123.

3.3.6 All Other Fastening Assemblies (Including Brackets): The bolts, used to connect the lead and extension sections, or connect shaft to Type B brackets, conform to ASTM F3125 Grade A325 or SAE J429 Grade 5, having a tensile strength of 120,000 psi (827 MPa). The matching hex nuts conform to ASTM A563 Grade C (or SAE J995 Gr. 2 for the coupler's nuts). Bolts and nuts can either be 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 (analysis and design) and drawings, prepared by a registered design professional, must be submitted to and be subjected to the approval of the code official for each project, and must be based on accepted engineering principles, as described in IBC Section 1604.4, and must conform to IBC Section 1810. Under the IRC, the registered design professional must design the helical pile system and devices, including the bracket, used as a foundation element. The applied loads must not exceed the published capacities shown in this report for the helical pile system and devices. The registered design professional may determine the design forces in accordance with IRC Section R301 or, as an alternative, in accordance with IBC provisions.

The design method for the steel components is Allowable Strength Design (ASD), described in IBC Sections 202 and 1802 (2015 IBC Section 1801) and AISC 360 Section B3. The engineering analysis must address helical foundation system performance related to structural and geotechnical requirements.

The structural analysis must consider all applicable internal forces (tension, compression, shears, bending moments and torsional moments, if applicable) due to applied loads, structural eccentricity, and maximum span(s) between helical foundations. The result of this analysis and the structural capacities must be used to select a helical foundation system.

The Helical Anchors direct load brackets (Type B brackets) exert a force on the footing or grade beam in which they are embedded. The force is equal in magnitude and opposite in direction to the force in the pile. A small lateral force is developed at the bracket embedment if the pile shaft is not perfectly plumb but within the permitted inclination from vertical of ±1°. The lateral shear is equal to sin(1°) or 0.0175 x the axial force exerted on the pile by the foundation.

The minimum embedment depth of piles for various loading conditions must be included based on the most stringent requirements of the following: engineering analysis, tested conditions described in this report, the site-specific geotechnical investigation report, and site specific load tests, if applicable.

The allowable strengths (allowable capacities) of the steel components of the Helical Anchors' helical foundation systems are described in Table 1 (for side load brackets, P1) and Table 2A, 2B and 2C (for direct load brackets, P1); Tables 3A and 3B (for shafts, P2); and Table 4 (for helical bearing plates, P3). The soil capacities, or capacities related to pile-soil interactions, (P4), are described in Section 4.1.5 and Table 5.

The overall capacity of the Helical Anchors' helical foundation systems depends upon the analysis of interaction of shafts, helical plates, and soils, and must be based on the least of the following conditions (P1, P2, P3 and P4), in accordance with IBC Section 1810.3.3.1.9:

- P4: Allowable load predicted by the individual helix bearing method (or Method 1) described in Section 4.1.5 of this report.
- P4: Allowable load predicted by the torque correlation method described in Section 4.1.5 of this report.
- P4: Allowable load predicted by dividing the ultimate capacity determined from load tests (Method 2 described in Section 4.1.5) by a safety factor of at least 2.0. This allowable load will be determined by a registered design professional for each site-specific condition. Under the 2024 and 2021 IBC, the load must comply with the IBC Section 1810.3.3.1.2.

- P3: Sum of the allowable axial capacity of helical bearing plates affixed to the pile shaft. See Section 4.1.4 of this report.
- P1: Allowable axial load capacity of the bracket. See Section 4.1.2 of this report.

A written report of the geotechnical investigation must be submitted to the code official as part of the required submittal documents, prescribed in IBC Section 107, at the time of the permit application. Under the IRC, a geotechnical investigation is not required if the helical pile foundation system and devices described in the evaluation report are being installed to support IRC structures defined in Section 2.2 of this evaluation report and the soil capacity of the helical pile system is established in accordance with Equation 3 in Section 4.1.5 of this report. The geotechnical report must include, but not be limited to, all of the following information:

- A plot showing the location of the soil investigation.
- A complete record of the soil boring and penetration test logs and soil samples.
- A record of soil profile.
- Information on ground-water table, frost depth and corrosion related parameters, as described in Section 5.5 of this report.
- Soil properties, including those affecting the design such as support conditions of the piles.
- Soil design parameters, such as shear strength parameters as required by Section 4.1.5; soil deformation parameters; and relative pile support conditions as defined in IBC Section 1810.2.1.
- Confirmation of the suitability of Helical Anchors' helical foundation systems for the specific project.
- Recommendations for design criteria, including but not be limited to: mitigations of effects of differential settlement and varying soil strength; and effects of adjacent loads.
- Recommended center-to-center spacing of helical pile foundations, if different from Section 5.14 of this report; and reduction of allowable loads due to the group action, if necessary.
- Field inspection and reporting procedures (to include procedures for verification of the installed bearing capacity when required).
- Load test requirements.
- Any questionable soil characteristics and special design provisions, as necessary.
- Expected total and differential settlement.
- The axial compression, axial tension and lateral load soil capacities for allowable capacities that cannot be determined from this evaluation report.
- Minimum helical pile depth, if any, based on local geologic hazards such as frost, expansive soils, or other condition.

4.1.2 Bracket Capacity (P1): Table 1 describes the allowable bracket capacity for Type A (Side Load) Brackets, and Tables 2A, 2B and 2C for Type B (Direct Load) Brackets. The connections of the building structure to the helical pile brackets must be designed and included in the construction documents. Only localized limit states of supporting concrete including 2-way punching shear and concrete bearing have been evaluated in this evaluation report. The concrete foundation must be designed and justified to the satisfaction of the code official with due consideration to the eccentricity of applied loads, including reactions provided by the brackets, acting on the concrete foundation. Refer to item 5.4 of this report for bracing requirement.

4.1.3 Shaft Capacity (P2): Table 3A describes the allowable axial compression, axial tension, lateral shear, and bending moment loads of the shaft. Table 3B describes the mechanical properties of the shaft which are based on a 50-year corrosion effect in accordance with Section 3.9 of AC358. The top of shafts must be braced as prescribed in IBC Section 1810.2.2, and the supported foundation structures such as concrete footings are assumed to be adequately braced such that the supported foundation structures provide lateral stability for the pile systems. In accordance with IBC Section 1810.2.1, 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 that is standing in air, water or in fluid soils plus additional 5 feet (1524 mm) when embedded into firm soil or additional 10 feet (3048 mm) when embedded into soft soil. Firm soils shall be defined as any soil with a Standard Penetration Test blow count of five or greater. Soft soil shall be defined as any soil with a Standard Penetration Test blow count greater than zero and less than five. Fluid soils shall be defined as any soil with a Standard Penetration Test blow count of zero [weight of hammer (WOH) or weight of rods (WOR)]. Standard Penetration Test blow count shall be determined in accordance with ASTM D1586. Under the IRC, when helical pile shaft are fully embedded into soil conditions defined in IRC Table R401.4.1(1) [2021, 2018 and 2015 IRC Table R401.4.1], the helical pile shafts are deemed adequately supported to prevent buckling. The shaft capacity of helical foundation systems in air, water, and fluid soils must be determined by a registered design professional.

The elastic lengthening of the pile shaft will be controlled by the strength and section properties of the shaft sections and coupler(s). For loads up to and include the allowable load limits found in this report, the elastic shortening of shaft can be estimated as: Δ_{shaft} = P L/(A E)

where:

Δ_{shaft} = Length change of shaft resulting from elastic shortening, in (mm).

P = applied axial load, lbf (N).

L = effective length of the shaft, in. (mm).

A = cross-sectional area of the shaft, see Table 3B, in.^{2} (mm^2).

E = Young's modulus of the shaft, see Table 3B, ksi (MPa).

For each coupler in the TS278217 bare helical pile ($2^7/_8$ x 0.217 inch), an elastic lengthening of 0.003 inch (0.076 mm) is estimated at allowable shaft load, and a slip of 0.133 inch (3.38 mm) is estimated at allowable shaft load. For each coupler in the TS278217 galvanized helical pile ($2^7/_8$ x 0.217 inch), an elastic lengthening of 0.003 inch (0.076 mm) is estimated at allowable shaft load, and a slip of 0.104 inch (2.64 mm) is estimated at allowable shaft load. For each coupler in the TS278203 bare helical pile ($2^7/_8$ x 0.203 inch), an elastic lengthening of 0.001 inch (0.025 mm) is estimated at allowable shaft load, and a slip of 0.268 inch (6.807 mm) is estimated at allowable shaft load. For each coupler in the TS278203 galvanized helical pile ($2^7/_8$ x 0.203 inch), an elastic lengthening of 0.002 inch (0.051 mm) is estimated at allowable shaft load, and a slip of 0.239 inch (6.08 mm) is estimated at allowable shaft load.

4.1.4 Helice Capacity (P3): Table 4 describes the allowable axial compression loads for helical bearing plates. For helical piles with more than one helix, the allowable helix capacity, P3, for the helical foundation systems and devices, may be taken as the sum of the least allowable capacity of each individual helix.

4.1.5 Soil Capacity (P4): Table 5 describes the geotechnical related properties of the piles. The allowable compressive or tensile soil capacity (P4) must be determined by a registered design professional in accordance with a site-specific geotechnical report, as described in Section 4.1.1 combined with the individual helix bearing method (Method 1) or from field loading 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 must be equal to or greater than what is predicted by Method 1 or 2, described above.

The individual bearing method is determined as the sum of the individual areas of the helical bearing plates times the ultimate bearing capacity of the soil or rock comprising the bearing stratum for helix plates. Under the 2024 and 2021 IBC (Section 1810.3.3.1.9), the total ultimate axial load capacity is equal to the sum of the areas of the helical bearing plates times the ultimate bearing capacity of the soil or rock comprising the bearing stratum plus the shaft resistance. The shaft resistance is equal to the area of the shaft above the uppermost helical bearing plate times the ultimate skin friction.

The design allowable axial capacity must be determined by dividing the total ultimate axial load capacity predicted by either Method 1 or 2, above, divided by a safety factor of at least 2. Under the 2024 and 2021 IBC, the load tests must comply with IBC Section 1810.3.3.1.2.

Under the IRC, if the helical pile system is being installed to support structures governed by the IRC as defined in Section 2.2 of this report, and a site-specific geotechnical report is not available, a factor of safety (FOS) of 2.5 must be used with the torque correlation method in lieu of Method 1 or 2 to determine allowable soil capacity of the pile (Equation 3).

With the torque correlation method, the ultimate axial soil capacity (P_{ult}) of the pile and the allowable axial soil capacity (P_a) of the pile are predicted as follows:

$P_{ult} = K_t \times T$ (Equation 1)

$P_a = 0.5\ P_{ult}$ (Equation 2)

$P_a = 0.4\ P_{ult}$ (Equation 3)

where:

P_{ult} = Ultimate axial compressive capacity (lbf or N) of helical pile, which must be limited to the maximum ultimate values noted in Table 5.

P_a = Allowable axial compression capacity (lbf or N) of helical piles, which must be limited to the maximum allowable values noted in Table 5.

K_t = Torque correlation factor per Table 5.

T = Final installation torque defined as the last torque reading taken when terminating the helical pile installation, which must not exceed the maximum installation torque rating noted in Table 5 of this report.

The allowable lateral soil capacity of the TS278217 helical pile is 915 lbf (4.1 kN). It is based on field testing of the $2^7/_8$-inch-diameter (73 mm) and 0.217-inch wall thickness (5.52 mm) helical pile with a single 8-inch-diameter (203 mm) helix plate installed in firm clay soil, having an average standard penetration test blow count of 20, and a minimum embedment of 16 feet (4.88 m). For other soil conditions, the lateral capacity of the pile must be determined by a registered design professional.

The allowable lateral soil capacity of the TS278203 helical pile is 955 lbf (4.25 kN). It is based on field testing of the $2^7/_8$-inch-diameter (73 mm) and 0.203-inch wall thickness (5.15 mm) helical pile with a single 10-inch-diameter (254 mm) helix plate installed in firm clay soil, having an average standard penetration test blow count of 17 and a minimum embedment of 16.5 feet (5 m). For other soil conditions, the lateral capacity of the pile must be determined by a registered design professional.

4.2 Installation:

4.2.1 General: The Helical Anchors' helical foundation systems must be installed by Helical Anchors trained and authorized installers. 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. In cases where the installation depth is less than 12D, the minimum embedment depth shall be determined by a registered design professional based on site-specific soil conditions, which must be subject to the approval of the code official. For tension applications where the helical pile is installed at an embedment depth less than 12D, the torque-correlation soil capacity, P4, is outside the scope of this report.

The Helical Anchors' helical foundation systems must be installed in accordance with this section (Section 4.2), IBC Section 1810.4.11, the site-specific approved construction documents (engineering plans and specifications), and the manufacturer's written installation instructions. In case of conflict, the most stringent requirement governs.

4.2.2 Helical Piles: The helical piles must be installed according to a preapproved plan of placement. Installation begins by attaching the helical pile lead section to the torque motor using a drive tool and drive pin. Next, crowd must be applied to force the pilot point into the ground at the proper location, inclination, and orientation, as described in the placement plan. Then the pile must be rotated into the ground in a smooth, clockwise, continuous manner while maintaining sufficient crowd to promote normal advancement. Installation continues by adding extension sections as necessary. Refer to Sections 3.2.1 and 3.3.6 of this report and the approved construction documents for type, grade, size and number of bolts and nuts that are required to connect the shaft sections. Inclination and alignment shall be checked and adjusted periodically during installation. Connection bolts between shaft sections shall be snug-tightened as defined in Section J3 of AISC 360. Care shall be taken not to exceed the maximum installation torque rating (shown in Table 5) of the helical piles during installation. Helical piles must be advanced until axial capacity is verified by achieving the required final installation torque as indicated by the torque correlation method described in Section 4.1.5, and the minimum depth, if any, as specified by the geotechnical report Section 4.1.1.

4.2.3 Type A Side Load Brackets: Type A brackets must be installed as specified in the approved plans. Installation of brackets requires an area adjacent to the building foundation to be excavated at each location thus exposing the footing, column, steel wall, or grade beam. The area to be exposed should be a minimum width of 18 inches and should extend below the bottom of the footing or grade beam by a minimum of 12 inches. Any soil attached to the bottom of the footing or grade beam should be removed prior to bracket installation. The footing or grade beam must be propped by chipping away the irregularities from the side or bottom for a sure bracket attachment. Existing concrete footing or grade beam capacity must not be altered, such as notching of concrete or cutting of reinforcing steel, without the approval of the registered design professional and the code official. Prepping of the footing allows for the bracket to be mounted to a reasonably flat, smooth, and full bearing surface. The bracket to the foundation or grade beam may be connected by using two concrete anchor bolts. The bracket is rotated into place under the existing concrete footing or grade beam and raised into position. Any excess pile length will be cut off level to enable the mounting of the bracket. The T-pipe for SDB bracket or bracket cap for SDB50 bracket will be placed over the helical pile and bracket. The threaded rods, steel bolts, hex nuts, and washers, supplied with the bracket, are added to hold the bracket in position. The hex nuts shall be snug tightened, as defined in Section J3 of AISC 360. Coupling nuts, jacking bracket, and lifting jack are installed to raise the foundation to the desire elevation. Any lifting of the existing structure must be verified by a registered design processional and is subjected 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 the T-pipe or cap are tightened, and the jacking brackets and lifting jacks are removed. The field cutting and bolting must be in accordance with the most restrictive requirements as described in the evaluation report, the IBC, AISC 360, and the manufacturer's written instructions. The exaction must be backfilled in accordance with IBC Section 1804.

4.2.4 Type B Direct Load Brackets: Type B brackets must be placed over the top of the helical piles. The top of the 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 bearing contact between the top of the pile shaft and the bracket. One, two or three ¾-inch-diameter (19 mm) bolts and hex nuts as described in Section 3.3.6 of this report must be used for bracket installation as indicated in Tables 2A and 2B. The NCCH2788812 bracket requires one bolt and the NCCH2788834 bracket requires three bolts for installation to the pile shaft. 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 2C of this report. The concrete foundation must be cast around the bracket in accordance with the approved construction documents.

4.3 Special Inspection (Per IBC):

Special inspections in accordance with IBC Section 1705.9 must be performed continuously during installation of Helical Anchors' helical foundation systems (piles and brackets). Items to be recorded and confirmed by the special inspector must include, but are not limited to, the following:

1. Verification of the product manufacturer, the manufacturer's certification of installers.
2. Product identification including lead sections, couplings, extension sections, brackets, bolts, and nuts, as specified in the construction documents and this evaluation report.
3. Installation equipment used.
4. Written installation procedures.
5. Tip elevations, the installation torque and final depth of the helical foundation systems.
6. Inclination and position/location of helical piles.
7. Tightness of all bolted connections.
8. Verification that direct load bracket cap plates are in full contact with the top of the pile shaft.
9. Compliance of the installation with the approved construction documents and this evaluation report.

Continuous special inspections of helical pile systems and devices installed under the provisions of the IRC defined in this evaluation report are not required.

5.0 CONDITIONS OF USE:

The Helical Anchors' helical foundation systems described in this report, comply with or are suitable alternative to what is specified in, the code listed in Section 1.0 of this report, subject to the following conditions:

5.1 The Helical Anchors' helical foundation systems are manufactured, identified, and installed in accordance with this report, the site-specific approved construction documents (engineering plans and specifications), IBC Section 1810.4.11, and the manufacturer's written installation instructions. In case of conflict, the most stringent requirement governs.

5.2 The Helical Anchors' helical foundation systems may be used to support structures assigned to Seismic Design Categories (SDCs) A through F in accordance with the IBC; and SDCs A through C: D through D_2; and E in accordance with the IRC. Anchorage must be addressed by the registered design professional for each site in accordance with Section 5.3 of this report and subject to approval by the code official.

5.3 When installed in Seismic Design Categories D, E and F under the IBC; and D through D_2 and E under the IRC, the following conditions must be considered:

a. The strength of the top bracket connection to the shaft and to the foundation of the structure shall comply with IBC Section 1810.3.11.2 and must not exceed published capacities noted in Section 4.1.2 of this report.

b. The shaft seismic flexural length must be determined by registered design professional in accordance with applicable code sections of the IBC. The shaft seismic flexural length is defined as the length of the shaft equal to 120 percent of the shaft flexural length.

c. The shaft couplers shall be limited to the shaft capacity reported in Section 4.1.3 of this report and must comply with requirements in IBC Section 1810.3.6.1.

d. The analysis of the seismic forces imparted on the bracket, bracket connection to foundation and pile must be prepared by a registered design professional taking into account soil characteristics such as liquefiable zone, length of pile in air or length of fluid conditions per the appropriate code.

5.4 Type A (Side Load) and Type B (Direct Load) brackets must be used only to support structures that are laterally braced as defined in IBC Section 1810.2.2. Shaft couplings must be located within firm or soft soil as defined in Section 4.1.3.

5.5 The installations of Type A (Side Load) and Type B (Direct Load) brackets are limited to regions of concrete members where analysis indicates no cracking at service load levels.

5.6 The Helical Anchors' helical foundation systems when 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 are beyond scope of this report.

5.7 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.

5.8 The helical piles must be installed vertically into the ground with the maximum allowable angle of inclination of 1 degree. To comply with the requirements found in IBC Section 1810.3.1.3, the superstructure must be designed to resist the effects of helical pile eccentricity.

5.9 Engineering calculations and drawings, in accordance with recognized engineering principles, as described in IBC Section 1604.4, and complying with Section 4.1 of this report, prepared by a registered design professional, are provided to, and are approved by the code official.

5.10 The adequacy of the concrete structures that are connected to the Helical Anchors brackets must be verified by a registered design professional, in accordance with applicable code provisions, such as Chapter 13 of ACI 318 and Chapter 18 of IBC, and subject to the approval of the code official.

5.11 A geotechnical investigation report for each project site in accordance with Section 4.1.1 of this report must be provided to the code official for approval.

5.12 Special inspection is provided in accordance with Section 4.3 of this report.

5.13 The load combinations prescribed in IBC Section 1605.1 (2018 and 2015 IBC Section 1605.3.1) must be used to determine the applied loads. When using the alternative basic load combinations prescribed in IBC Section 1605.2 (2018 and 2015 IBC 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.

5.14 The applied loads must not exceed the allowable capacities described in Section 4.1 of this report.

5.15 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 axially loaded helical piles is less than three times the diameter of the largest helix plate at the depth of bearing. An analysis prepared by a registered design professional must also be submitted where the center-to-center spacing of laterally loaded helical piles is less than eight times the least horizontal dimension of the pile shaft at the ground surface. Spacing between helical plates must not be less than 3D, where D is the diameter of the largest helical plate measured from the edge of the helical plate to the edge of the helical plate of the adjacent helical pile; or 4D, where the spacing is measured from the center-to-center of the adjacent helical pile plates.

5.16 Requirements described in footnotes of tables in this report must be satisfied.

5.17 Settlement of helical piles is beyond the scope of this evaluation report and must be determined by a registered design professional as required in IBC Section 1810.2.3.

5.18 The Helical Anchors' helical foundation systems are manufactured 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 Pile Systems and Devices AC358 (24a), published April 2025.

7.0 IDENTIFICATION

7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-3892) along with the name, registered trademark, or registered logo of the report holder [and/or listee] must be included in the product label.

7.2 In addition, the Helical Anchors, Inc. (Helical Anchors) helical foundation systems (including lead shafts, extension shafts, brackets, and boxed hardware) are identified by a tag or label bearing the logo, name, and address of the report holder (Helical Anchor, Inc.) or listee (BHUJ Polymers Private Limited), the product number, and order number.

7.3 The report holder's contact information is the following:

HELICAL ANCHORS, INC.
5101 BOONE AVENUE NORTH
MINNEAPOLIS, MINNESOTA 55428
UNITED STATES OF AMERICA
(763) 201-6552
www.helicalanchorsinc.com
girish@helicalanchorsinc.com

7.4 The additional listee's contact information is the following:

BHUJ POLYMERS PRIVATE LIMITED.
SURVEY NO 339/1, PAIKI 1,
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TABLE 1—SIDE LOAD BRACKET CAPACITY (P1) [1,2]

PRODUCT NUMBER	SHAFT DIAMETER AND WALL THICKNESS (inches)	(P1) ALLOWABLE CAPACITY (kips) 2,500 psi Concrete Minimum		
		Compression	Tension	Lateral
SDB	$2\frac{7}{8}$ x 0.217	30.2	See Note 3	See Note 4
SDB50	$2\frac{7}{8}$ x 0.203	24.0	See Note 3	See Note 4

For **SI:** 1 inch= 25.4 mm; 1 kip = 4.448 kN, 1 psi = 6.895 kPa.

[1] Load capacity is based on full scale load tests per AC358 with an installed 5 foot unbraced pile length having a maximum of one coupling per IBC Section 1810.2.1. Load capacity assumes the structure is sidesway braced per IBC Section 1810.2.5. Side load brackets must be concentrically loaded. Side load bracket must be fully engaged with bottom of concrete foundation. Only localized limit states of mechanical strength of steel components and concrete including bearing have been evaluated. Refer to Sections 5.4 and 5.9 of this report for additional requirements.

[2] Allowable capacities include an allowance for corrosion over a 50-year service life and presume the supported structure is braced in accordance with IBC Section 1810.2.2.

[3] The tension load capacity of the side load brackets must be designed by registered design professional in accordance with Chapter 18 of the IBC.

[4] The lateral load capacity of the side load brackets must be designed by registered design professional in accordance with Chapter 18 of the IBC.

TABLE 2A—DIRECT LOAD BRACKET ALLOWABLE CAPACITIES SEISMIC DESIGN CATEGORIES A AND B[1]

Product Number	Shaft Thickness, inches	Steel Finish	Min. Concrete Compressive Strength[4], psi	Axial Compression[6]		Axial Tension[7,9]		Lateral Load[8]	
				Min. Concrete Cover[2] (kips)	Full Concrete Cover[3] (kips)	Min. Concrete Cover[2] (kips)	Full Concrete Cover[3] (kips)	Min Concrete Cover[2] (kips)	Full Concrete Cover[3] (kips)
NCCH2788834	0.217	Bare	2500	NR	45.0	NR	30.1[11]	NR	0.91
NCCH2788812	0.203	Bare	2500	NR	10.7	NR	2.0[10]	NR	1.52[5]
	0.217			NR	21.9	NR	10.8[10]	NR	0.91
NCCH2782036634	0.203	Bare	2500	8.93	37.29	1.56	24.39	1.28	7.95
			3000	9.78	37.29	1.70	24.39	1.40	8.33
		Galv.	2500	8.95	44.64	1.56	30.04	1.28	9.16
			3000	9.81	44.64	1.71	30.04	1.40	9.63
NCCH2782176634	0.217	Bare	2500	8.93	42.06	1.56	42.87	1.28	12.68
			3000	9.78	42.06	1.28	42.87	1.40	12.86
		Galv.	2500	8.95	49.98	1.56	53.02	1.28	14.51
			3000	9.81	49.98	1.71	53.02	1.40	15.42
NCCH2782038812	0.203	Bare	2500	10.72	37.29	2.00	20.57	1.52	7.11
			3000	11.74	37.29	2.19	20.57	1.66	7.79
		Galv.	2500	10.75	44.64	2.01	23.33	1.52	7.44
			3000	11.77	44.64	2.20	23.33	1.66	8.14
NCCH2782178812	0.217	Bare	2500	10.72	42.06	2.00	20.57	1.52	7.11
			3000	11.74	42.06	2.19	20.57	1.66	7.79
		Galv.	2500	10.75	49.98	2.01	23.33	1.52	7.44
			3000	11.77	49.98	2.20	23.33	1.66	8.14
NCCH2782038834	0.203	Bare	2500	10.72	37.29	2.00	24.39	1.52	8.29
			3000	11.71	37.29	2.19	24.39	1.66	8.14
		Galv.	2500	10.75	44.64	2.01	30.04	1.52	9.52
			3000	11.77	44.64	2.20	30.04	1.66	9.46
NCCH2782178834	0.217	Bare	2500	10.72	58.41	NR	NR	1.52	13.25
			3000	11.74	58.41	NR	NR	1.66	13.25
		Galv.	2500	10.75	69.42	NR	NR	1.52	15.50
			3000	11.77	69.42	NR	NR	1.66	15.50
NCCH278203101034	0.203	Bare	2500	12.51	37.29	2.45	24.39	1.76	8.08
			3000	13.71	37.29	2.68	24.39	1.93	8.50
		Galv.	2500	12.54	44.64	2.46	30.04	1.76	9.32
			3000	13.73	44.64	2.69	30.04	1.93	9.84
NCCH278217101034	0.217	Bare	2500	12.51	42.06	NR	NR	1.76	13.25
			3000	13.71	42.06	NR	NR	1.93	13.25
		Galv.	2500	12.54	49.98	NR	NR	1.76	15.50
			3000	13.73	49.98	NR	NR	1.93	15.50

For **SI:** 1 inch = 25.4 mm, 1 kip = 4.448 kN, 1 psi= 6.89 kPa.

NR= not reported.

[1]Capacities include allowance for corrosion over a 50-year service life in accordance with Section 3.9 of AC358.

[2]Refer to Figure 2C and Table 2C for the code-prescribed minimum concrete cover dimensions.

[3]Refer to Figure 2C and Table 2C for the required full concrete cover dimensions such that concrete related limit states do not govern the bracket capacity.
[4]Concrete strength is the specified compressive strength at 28 days.
[5]Reinforcement of at least a No. 4 bar or greater must be provided between the bracket and the concrete edge and with the reinforcement enclosed within stirrups spaced at not more than 4 inches as specified in Section 17.7.2.5.1 of ACI 318-19 (Section 17.5.2.4 of ACI 318-14).
[6]The allowable compressive load capacity is based on the mechanical strength of the steel bracket, concrete punching shear capacity, and concrete bearing strength. The allowable load capacities have been determined assuming that minimum reinforcement has been provided as specified by ACI 318 Section 9.6.1.2.
[7]The allowable tensile load capacity is based on the mechanical strength of the steel bracket, punching shear capacity and bearing to concrete footing. The allowable load capacities have been determined assuming that minimum reinforcement has been provided as specified by ACI 318 Section 9.6.1.2.
[8]The allowable lateral capacity is based on limit states associated with mechanical steel strength, concrete breakout in accordance with ACI 318, and bracket bearing on unreinforced concrete in accordance with ACI 318.
[9]The capacity is based using two ¾-inch through bolts as described in Section 3.3.6 of this report, unless noted otherwise in the table.
[10]The capacity is based using one ¾-inch through bolt as described in Section 3.3.6 of this report.
[11] The capacity is based using three ¾-inch through bolts as described in Section 3.3.6 of this report.

TABLE 2B—DIRECT LOAD BRACKET ALLOWABLE CAPACITIES SEISMIC DESIGN CATEGORIES C, D, E AND F[1]

Product Number	Shaft Thickness, inch	Steel Finish	Min. Concrete Compressive Strength[4], psi	Axial Compression[5]		Axial Tension[6,8]		Lateral Load[7]	
				Min. Concrete Cover[2] (kips)	Full Concrete Cover[3] (kips)	Min. Concrete Cover[2] (kips)	Full Concrete Cover[3] (kips)	Min Concrete Cover[2] (kips)	Full Concrete Cover[3] (kips)
NCCH2782036634	0.203	Bare	3,000	9.78[6]	37.29[6]	1.28[7,11]	18.29[7,11]	1.00[8]	5.95[8]
		Galv.	3,000	9.81	44.64	1.28	22.53	1.00	6.88
NCCH2782176634	0.217	Bare	3,000	9.78	42.06	1.28	30.18	1.00	9.19
		Galv.	3,000	9.81	49.98	1.28	30.38	1.00	11.01
NCCH2782038812	0.203	Bare	3,000	11.74	37.29	1.65	15.43	1.19	5.57
		Galv.	3,000	11.77	44.64	1.65	17.50	1.19	5.82
NCCH2782178812	0.217	Bare	3,000	11.74	42.06	1.65	15.43	1.19	5.57
		Galv.	3,000	11.77	49.98	1.65	17.50	1.19	5.82
NCCH2782038834	0.203	Bare	3,000	11.74	37.29	1.65	18.29	1.19	5.82
		Galv.	3,000	11.77	44.64	1.65	22.53	1.19	6.76
NCCH2782178834	0.217	Bare	3,000	11.74	58.41	NR	NR	1.19	10.25
		Galv.	3,000	11.77	69.42	NR	NR	1.19	12.14
NCCH278203101034	0.203	Bare	3,000	13.71	37.29	2.01	18.29	1.38	6.07
		Galv.	3,000	13.73	44.64	2.02	22.53	1.38	7.03
NCCH278217101034	0.217	Bare	3,000	13.71	42.06	NR	NR	1.38	9.99
		Galv.	3,000	13.73	49.98	NR	NR	1.38	11.75

For **SI:** 1 inch = 25.4 mm, 1 kip = 4.448 kN, 1 psi=6.89 kPa.
NR= Not Reported.
[1]Capacities include allowance for corrosion over a 50-year service life in accordance with Section 3.9 of AC358.
[2]Refer to Figure 2C and Table 2C for the code-prescribed minimum concrete cover dimensions.
[3]Refer to Figure 2C and Table 2C for the required full concrete cover dimensions such that concrete related limit states do not govern the bracket capacity.
[4]Concrete strength is the specified compressive strength at 28 days.
[5]The allowable compressive load capacity is based on the mechanical strength of the steel bracket, concrete punching shear capacity, and concrete bearing strength. The allowable load capacities have been determined assuming that minimum reinforcement has been provided as specified by ACI 318 Section 9.6.1.2.
[6]The allowable tensile load capacity is based on the mechanical strength of the steel bracket, punching shear capacity and bearing to concrete footing. The allowable load capacities have been determined assuming that minimum reinforcement has been provided as specified by ACI 318 Section 9.6.1.2.
[7]The allowable lateral capacity is based on limit states associated with mechanical steel strength, concrete breakout in accordance with ACI 318, and bracket bearing on unreinforced concrete in accordance with ACI 318.
[8] The capacity is based using two ¾-inch through bolts as described in Section 3.3.6 of this report, unless noted otherwise in the table.

TABLE 2C—DIRECT LOAD BRACKET CONCRETE COVERS[1,5]

Product Number	Shaft Thickness, inch	Steel Finish	Concrete Compressive Strength[4]	Minimum Concrete Covers[2], inches				Full Concrete Covers[3], inches											
								For Axial Compression				For Axial Tension[6]				For Lateral			
				C[5,6]	B	X1	X2	C	B	X1	X2	C	B	X1	X2	C	B	X1	X2
NCCH2788834	0.217	Bare	2500	NR	NR	NR	NR	10.75	29.5	3	10.75	8.3	24.6	10.3	4	4	16	4	4
NCCH2788812	0.203	Bare	2500	NR	NR	NR	NR	4	16	3	4	4	16	3	4	4	16	3	4
	0.217			NR	NR	NR	NR	6.7	21.4	3	6.7	4	16.1	6	4	4	16	4	4
NCCH2782036634	0.203	Bare	2500	4	14	3	4	10.5	27	3	11	10	26	10	4	10	26	10	4
			3000 Table 2A	4	14	3	4	10	26	3	10	9.5	25	10	4	9.5	25	10	4
			3000, Table 2B	4	14	3	4	10	26	3	10	9.5	25	10	4	9.5	25	10	4
		Galv.	2500	4	14	3	4	11.5	29	3	12	11	28	11	4	11	28	11	4
			3000 Table 2A	4	14	3	4	11	28	3	11	10.5	27	11	4	10.5	27	11	4
			3000 Table 2B	4	14	3	4	11	28	3	11	10.5	27	11	4	10.5	27	11	4
NCCH2782176634	0.217	Bare	2500	4	14	3	4	11.5	29	3	12	13.5	33	14	4	13.5	33	14	4
			3000 Table 2A	4	14	3	4	10.5	27	3	11	13	32	13	4	13	32	13	4
			3000, Table 2B	4	14	3	4	10.5	27	3	11	13	32	13	4	13	32	13	4
		Galv.	2500	4	14	3	4	12.5	31	3	13	15	36	15	4	15	36	15	4
			3000 Table 2A	4	14	3	4	12	30	3	12	14.5	35	14	4	14.5	35	14	4
			3000 Table 2B	4	14	3	4	12	30	3	12	14.5	35	14	4	14.5	35	14	4
NCCH27822038812	0.203	Bare	2500	4	16	3	4	10	28	3	10	8.5	25	9	4	8.5	25	9	4
			3000 Table 2A	4	16	3	4	9	26	3	9	8.5	25	9	4	8.5	25	9	4
			3000, Table 2B	4	16	3	4	9	26	3	9	8.5	25	9	4	8.5	25	9	4
		Galv.	2500	4	16	3	4	11	30	3	11	9	26	9	4	9	26	9	4
			3000 Table 2A	4	16	3	4	10.5	29	3	11	9	26	9	4	9	26	9	4
			3000 Table 2B	4	16	3	4	10.5	29	3	11	9	26	9	4	9	26	9	4
NCCH27822178812	0.217	Bare	2500	4	16	3	4	10.5	29	3	11	8.5	25	9	4	8.5	25	9	4
			3000 Table 2A	4	16	3	4	10	28	3	10	8.5	25	9	4	8.5	25	9	4
			3000, Table 2B	4	16	3	4	10	28	3	10	8.5	25	9	4	8.5	25	9	4
		Galv.	2500	4	16	3	4	11.5	31	3	12	9	26	9	4	9	26	9	4
			3000 Table 2A	4	16	3	4	11	30	3	11	9	26	9	4	9	26	9	4
			3000 Table 2B	4	16	3	4	11	30	3	11	9	26	9	4	9	26	9	4
NCCH27822038834	0.203	Bare	2500	4	16	3	4	10	28	3	10	9.5	27	10	4	9.5	27	10	4
			3000 Table 2A	4	16	3	4	9	26	3	9	9	26	9	4	9	26	9	4
			3000, Table 2B	4	16	3	4	9	26	3	9	9	26	9	4	9	26	9	4
		Galv.	2500	4	16	3	4	11	30	3	11	10.5	29	11	4	10.5	29	11	4
			3000 Table 2A	4	16	3	4	10.5	29	3	11	10	28	10	4	10	28	10	4
			3000 Table 2B	4	16	3	4	10.5	29	3	11	10	28	10	4	10	28	10	4
NCCH27822178834	0.217	Bare	2500	4	16	3	4	13	34	3	13	NR	NR	NR	NR	13	34	15	4
			3000 Table 2A	4	16	3	4	12	32	3	12	NR	NR	NR	NR	12	32	14	4
			3000, Table 2B	4	16	3	4	12	32	3	12	NR	NR	NR	NR	12	32	14	4
		Galv.	2500	4	16	3	4	14.5	37	3	15	NR	NR	NR	NR	14.5	37	16	4
			3000 Table 2A	4	16	3	4	13.5	35	3	14	NR	NR	NR	NR	13.5	35	16	4
			3000 Table 2B	4	16	3	4	13.5	35	3	14	NR	NR	NR	NR	13.5	35	16	4
NCCH2782203101034	0.203	Bare	2500	4	18	3	4	9	28	3	9	9	28	9	4	9	28	9	4
			3000 Table 2A	4	18	3	4	8.5	27	3	9	8.5	27	9	4	8.5	27	9	4
			3000, Table 2B	4	18	3	4	8.5	27	3	9	8.5	27	9	4	8.5	27	9	4
		Galv.	2500	4	18	3	4	10	30	3	10	10	30	10	4	30	10	10	4
			3000 Table 2A	4	18	3	4	9.5	29	3	10	9.5	30	10	4	9.5	30	10	4
			3000 Table 2B	4	18	3	4	9.5	29	3	10	9.5	30	10	4	9.5	30	10	4
NCCH2782217101034	0.217	Bare	2500	4	18	3	4	10	30	3	10	NR	NR	NR	NR	10	30	19	4
			3000 Table 2A	4	18	3	4	9.5	29	3	10	NR	NR	NR	NR	9.5	29	17	4
			3000, Table 2B	4	18	3	4	9.5	29	3	10	NR	NR	NR	NR	9.5	29	17	4
		Galv.	2500	4	18	3	4	11	32	3	11	NR	NR	NR	NR	11	32	22	4
			3000 Table 2A	4	18	3	4	10.5	31	3	11	NR	NR	NR	NR	10.5	31	20	4
			3000 Table 2B	4	18	3	4	10.5	31	3	11	NR	NR	NR	NR	10.5	31	20	4

For **SI:** 1 inch = 25.4 mm, 1 psi = 6.895 kPa.

NR= Not Reported.

Table 2C Notes:

[1]See Figure 2C for concrete cover designations.
[2]Minimum concrete covers are prescribed in IBC Section 1810.3.11.
[3]Full concrete covers are determined to ensure that concrete related limit states do not govern the bracket capacities.
[4]Concrete strength is the specified compressive strength at 28 days.
[5]Dimensions B and C apply to both bracket width and length directions.
[6]For dimension X1 determination, in accordance with Section 14.5.1.7 of ACI 318-19 under the 2024 and 2021 IBC, and Section 14.5.1.7 of ACI 318-14 under the 2018 and 2015 IBC, concrete is assumed cast against soil, and a 2-inch extra concrete thickness is included in X1.

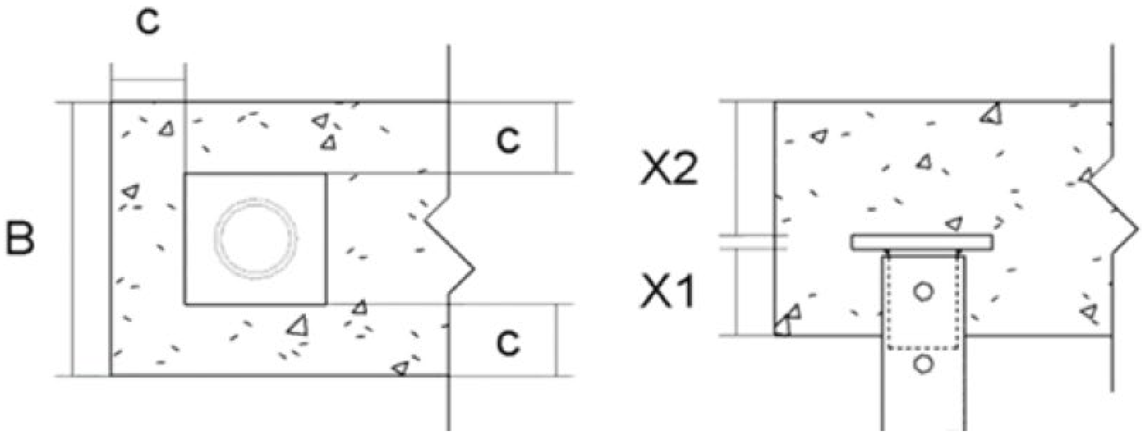


FIGURE 2C—DIRECT LOAD BRACKET CONCRETE COVERS DIAGRAM

TABLE 3A—SHAFT ALLOWABLE CAPACITY (P2)[1]

SHAFT TYPE	STEEL FINSIH	UNBRACED SHAFT LENGTH, L_u (FT) [2]	(P2) ALLOWABLE CAPACITY (KIPS)					
			COMPRESSION (KIPS)[3,4]			TENSION (KIPS)	LATERAL SHEAR (KIPS)	BENDING MOMENT (KIP-FT)
			0 Coupler	1 Coupler	2 Couplers			
TS278217: $2^{7}/_{8}$ inch OD x 0.217 inch wall thickness	Bare	0	62.2	62.2	62.2	42.9	18.6	3.4
		5	22.5	19.5	9.6			
		10	20.9	14.6	8.2			
		15	5.4	5.2	4.8			
		20	3.3	3.3	3.1			
	Galv.	0	73.9	73.9	73.9	53.0	22.2	4.0
		5	26.6	23.1	17.3			
		10	12.1	11.3	9.7			
		15	6.4	6.2	5.6			
		20	4.0	3.9	3.7			
TS278203: $2^{7}/_{8}$ inch OD x 0.203 inch wall thickness	Bare	0	37.3	37.3	37.3	24.4	10.0	2.1
		5	14.6	12.1	9.6			
		10	7.7	7.0	6.1			
		15	4.3	4.1	3.8			
		20	2.8	2.7	2.5			
	Galv.	0	44.6	44.6	44.6	30.0	12.1	2.6
		5	17.4	14.5	11.5			
		10	9.3	8.4	7.3			
		15	5.2	4.9	4.5			
		20	3.3	3.2	3.0			

For **SI:** 1 inch = 25.4 mm, 1 kip = 4.448 Kn, 1 kip-ft= 1.36 kN-m.

Table 3A Notes:

[1] Allowable capacities include an allowance for corrosion over a 50-year service life.
[2] L_u = Total unbraced pile length per IBC Section 1810.2.1, including the length in air, water or in fluid soils, and the embedment length into firm or soft soil (non-fluid soil). kL_u = total effective unbraced length of the pile, where kL_u = 0 represent a fully braced condition in that the total pile length is fully embedded in firm or soft soil and the supported structure is braced in accordance to IBC Section 1810.2.2.
[3] Number of couplings within L_u.
[4] The capacities shown in Table 2(A) are for $2^7/_8$-inch-diameter (0.217 or 0.203-inch wall thickness) piles installed with a maximum 1 degree of inclination from vertical and do not include the brackets as described in Sections 4.2.3 and 4.2.4. The capacities are also based on the assumption that the pile shaft is concentrically loaded and its end conditions are fixed/pinned (k = 0.8).

TABLE 3B—MECHANICAL PROPERTIES AFTER CORROSION LOSS[1] OF 2.875-INCH DIAMETER HELICAL SHAFT

Mechanical Properties	2.875-inch (0.217-inch wall thickness)		2.875-inch (0.203-inch wall thickness)	
Steel Finish	Bare[1]	Galv.[2]	Bare[1]	Galv.[2]
Steel Yield Strength, F_y (ksi)	80		51.5	
Steel Ultimate Strength, F_u (ksi)	100		74.0	
Modulus of Elasticity, E (ksi)	29,000		29,000	
Nominal Wall Thickness (inch)	0.217		0.203	
Design Wall Thickness (inch)	0.154	0.183	0.147	0.176
Outside Diameter (inch)	2.839	2.868	2.839	2.868
Inside Diameter (inch)	2.531	2.502	2.544	2.515
Cross Sectional Area (inch^2)	1.30	1.54	1.25	1.49
Moment of Inertia, I (inch^4)	1.17	1.40	1.13	1.36
Radius of Gyration, r (inch)	0.95	0.95	0.95	0.95
Section Modulus, S (inch^3)	0.83	0.97	0.80	0.95
Plastic Section Modulus, Z (inch^3)	1.11	1.32	1.07	1.28

For **SI:** 1 inch = 25.4 mm; 1 ksi = 6.89 MPa, 1 ft-lbf =1.36 N-m; 1 lbf =4.45 N.
[1] Dimensional 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.
[2] Dimensional properties are based on bare steel losing 0.013-inch steel thickness as indicated in Section 3.9 of AC358 for a 50-year service life.

TABLE 4—HELICAL BEARING PLATE CAPACITY (P3) – AXIAL COMPRESSION[1,2]

SHAFT TYPE	HELIX DIA. (IN)	HELIX THICKNESS (IN)	HELIX PITCH (IN)	ALLOWABLE CAPACITY[3] (P3) (KIPS)
TS278217: 2.875-inch (0.217-inch wall thickness)	8	0.375	3.0	57.8
	10	0.375	3.0	40.0
	12	0.375	3.0	52.2
	14	0.375	3.0	40.5
TS278203: 2.875-inch (0.203-inch wall thickness)	8	0.375	3.0	62.4
	10	0.375	3.0	62.9
	12	0.375	3.0	62.5
	14	0.375	3.0	62.4

For **SI:** 1 inch = 25.4 mm, 1 kip = 4.448 kN.

[1]For helical piles with more than one helix, the allowable helix capacity, P3, for the helical foundation systems, may be taken as the sum of the least allowable capacity of each individual helix.

[2]As described in Section 3.2.1 of this report, all helical bearing plates are made from same material, and have the same edge geometry, thickness and pitch.

[3]Allowable capacities include an allowance for corrosion over a 50-year service life.

TABLE 5—SOIL CAPACITY (P4)[1,6]

GEOTECHNICAL RELATED PROPERTIES	TS278217 HELICAL PILE ($2^7/_8$X0.217 inch)		TS278203 HELICAL PILE ($2^7/_8$X0.203 inch)	
	Axial Tension	**Axial Compression**	**Axial Tension**	**Axial Compression**
Mechanical Torsion Rating (ft-lbs)[3]	12,596	12,596	6,764	6,764
Maximum Torque Per Soil Tests (ft-lbs)[4]	11,000	12,500	6,382	6,647
Maximum Installation Torque Rating (ft-lbs)[5]	11,000	12,500	6,382	6,647
Torque Correlation Factor, K_t (ft^{-1})	8.0	8.5	9	9
Max. Ultimate Soil Capacity / Max. Allowable Soil Capacity (P4) from Torque Correlations (kips)[2]	88.0/44.0	106.2/53.1	57.4/28.7	59.8/29.9

For **SI:** 1 foot = 0.305 m, 1 lbf = 4.448 N, 1 lbf-ft = 1.356 N-m.

[1] Soil capacity (P4) must be determined per Section 4.1.5 of this report.

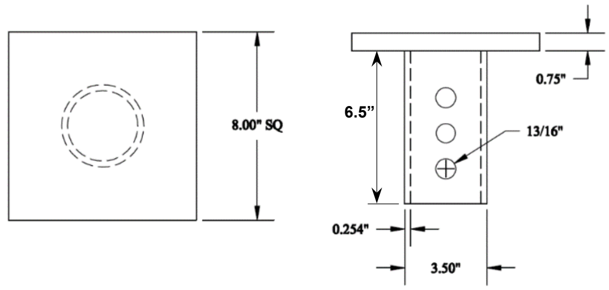
[2] Maximum ultimate soil capacity is determined from $P_{ult} = K_t \times T$ based on the corresponding maximum installation torque rating for the specific pile model. Allowable soil capacity is determined from $Pa = P_{ult}/2.0$ based on the corresponding maximum installation torque rating for the specific pile model. See Section 4.1.5 for additional information.

[3] Mechanical torsion rating is the maximum torsional resistance of the steel shaft.

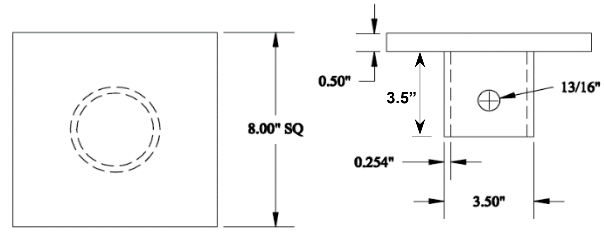
[4] Maximum Torque Per Soil Tests is the maximum torque achieved during field axial verification testing that was conducted to verify the pile axial capacity related to pile-soil interaction.

[5] Maximum Installation Torque rating is the lower of the “mechanical torsion rating” and the “maximum torque per soil tests”.

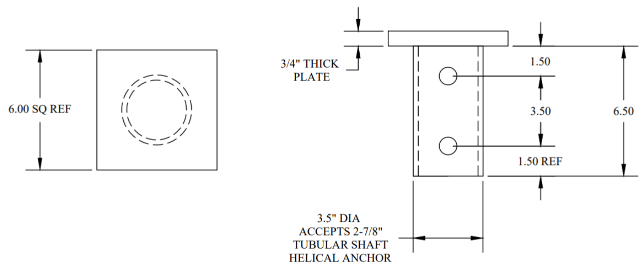
[6] See Section 4.1.5 for the lateral soil capacity.



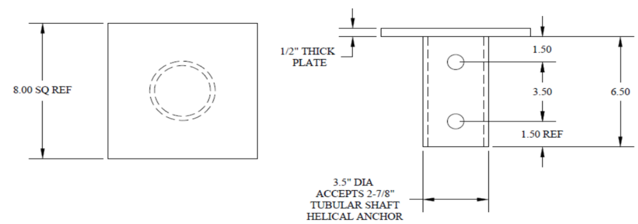
NCCH2788834 Bracket (for $2^{7}/_{8}$x0.217-inch Piles)
Steel of plate conforms to ASTM A36.
Steel of tube conforms to API-5CT N80.



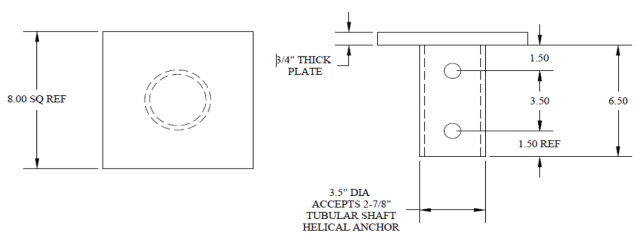
NCCH2788812 Bracket (for $2^{7}/_{8}$x0.217-inch and $2^{7}/_{8}$x0.203-inch Piles)
Steel of plate conforms to ASTM A36 or ASTM A572 Gr. 50.
Steel of tube conforms to API-5CT N80.



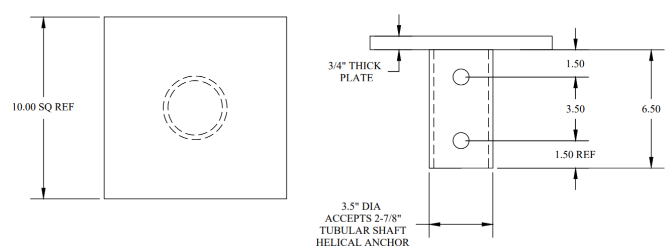
NCCH2782036634 Bracket (for $2^{7}/_{8}$x0.217-inch and $2^{7}/_{8}$x0.203-inch Piles)
Steel of plate conforms to ASTM A36.
Steel of tube conforms to API-5CT N80.



NCCH2782038812 Bracket (for $2^{7}/_{8}$x0.217-inch and $2^{7}/_{8}$x0.203-inch Piles)
Steel of plate conforms to ASTM A36.
Steel of tube conforms to API-5CT N80.



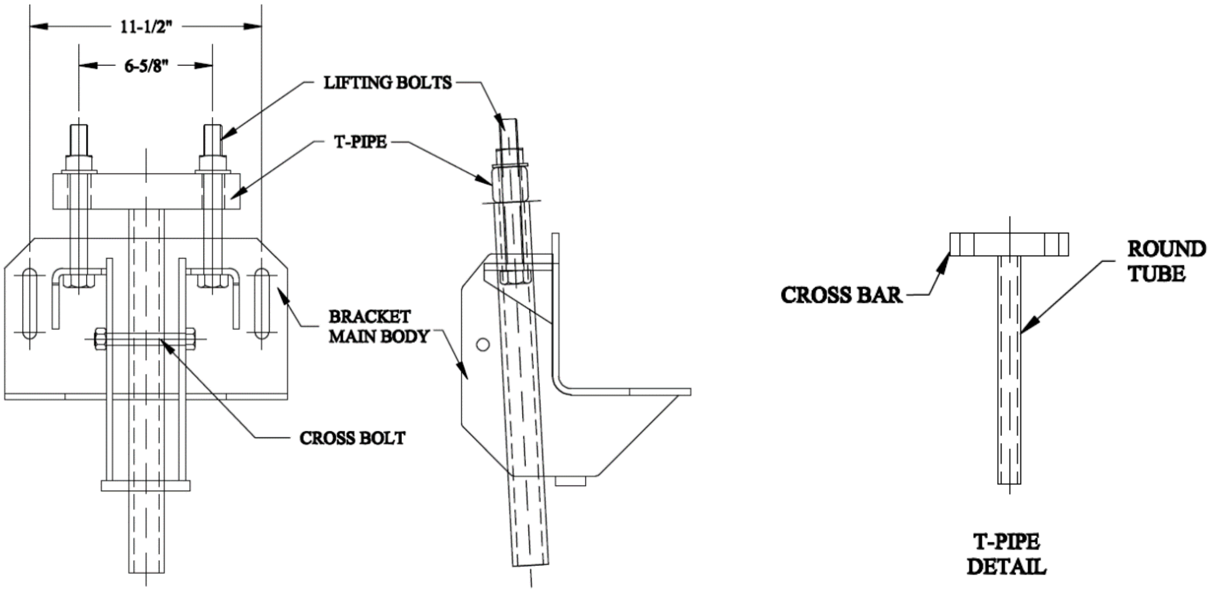
NCCH2782038834 Bracket (for $2^{7}/_{8}$x0.217-inch and $2^{7}/_{8}$x0.203-inch Piles)
Steel of plate conforms to ASTM A36.
Steel of tube conforms to API-5CT N80.



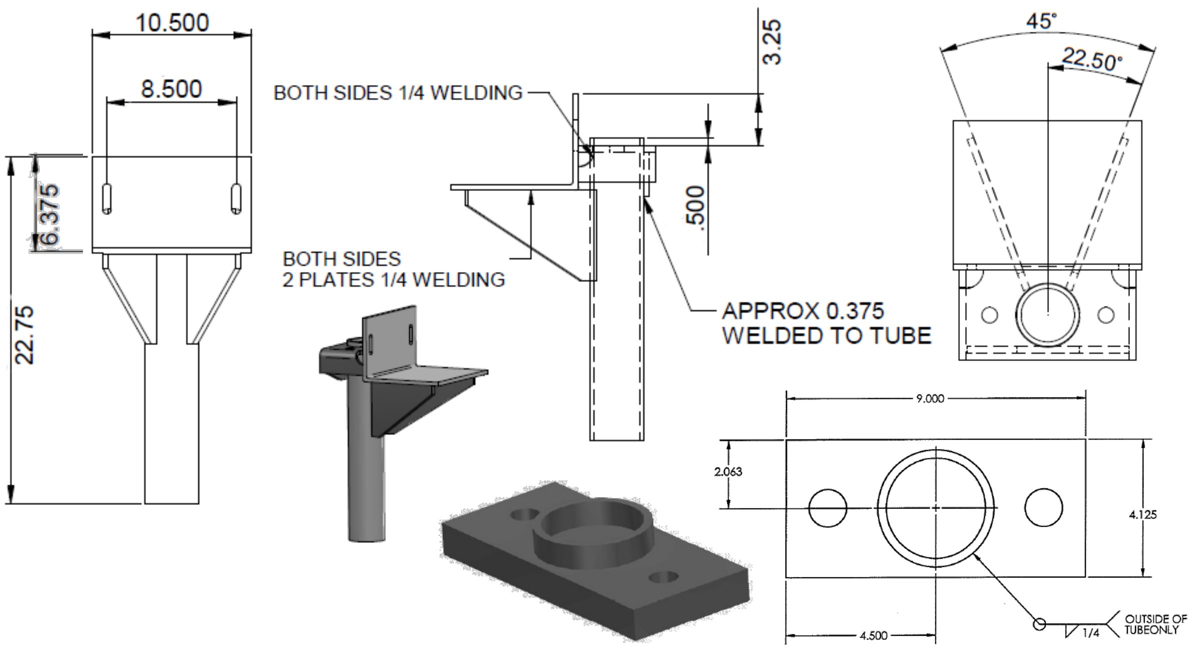
NCCH278203101034 Bracket (for $2^{7}/_{8}$x0.217-inch and $2^{7}/_{8}$x0.203-inch Piles)
Steel of plate conforms to ASTM A36.
Steel of tube conforms to API-5CT N80.

Notes:
- ASTM A36 steel has minimum yield strength of 36,000 psi (248 MPa) and minimum tensile strength of 58,000 psi (400 MPa).
- ASTM A572 Gr. 50 steel has minimum yield strength of 50,000 psi (345 MPa) and minimum tensile strength of 65,000 psi (450 MPa).
- API-5CT N80 steel has minimum yield strength of 80,000 psi (551 MPa) and minimum tensile strength of 100,000 psi (689 MPa).

FIGURE 1—TYPE B BRACKETS



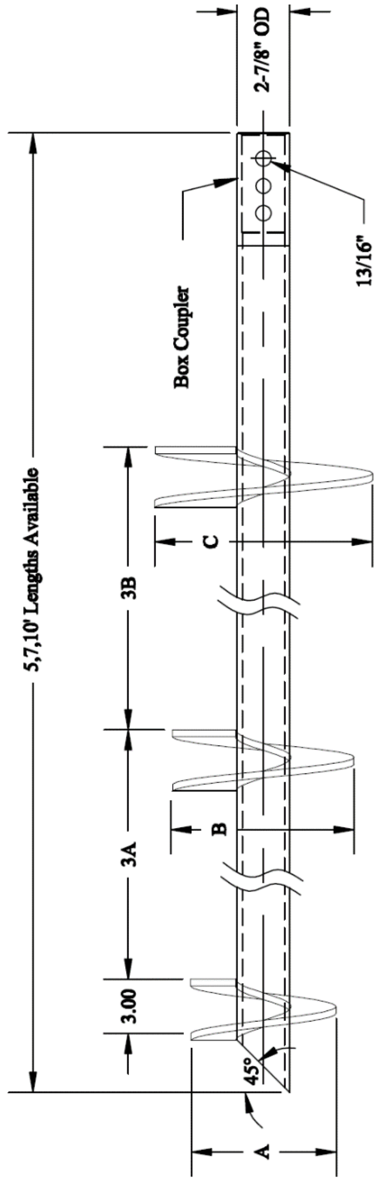
SDB bracket



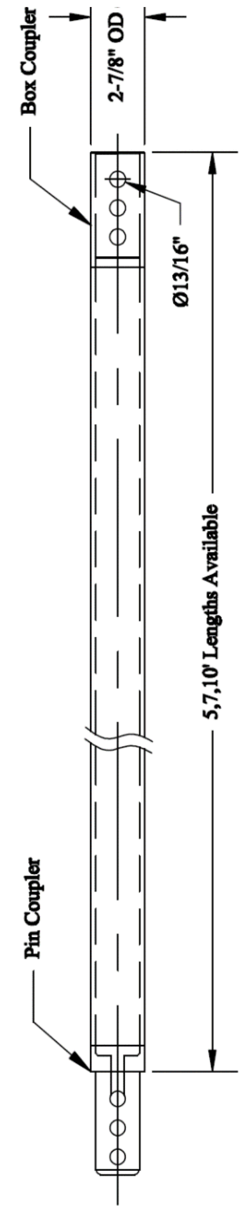
9 x 4$^{1}/_{8}$ x 1-inch Bracket Cap

SDB50 Bracket

FIGURE 2—TYPE A BRACKETS



HELICAL LEAD SHAFT SECTION



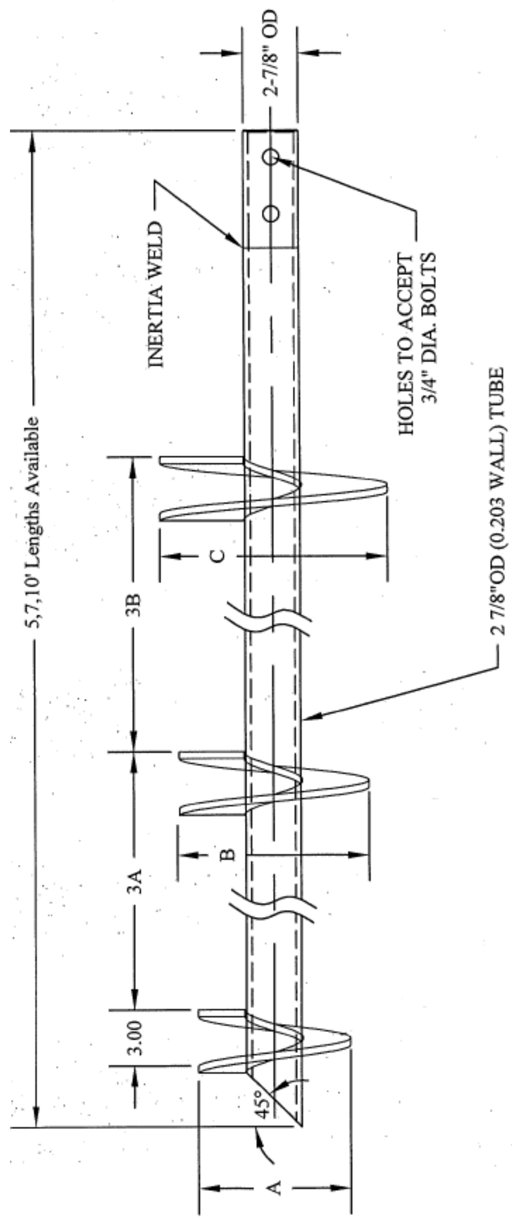
HELICAL EXTENSION SHAFT SECTION

Note:

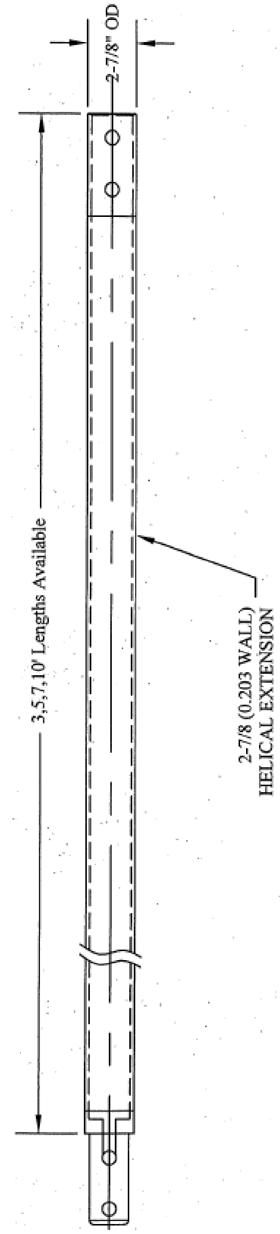
- For the TS278217 helical pile, wall thickness of lead section (TL278217) and extension section (TE278217) is 0.217 inch (5.512 mm).

$2^7/_8$X0.217 inch Helical Pile (TS278217)

FIGURE 3—HELICAL LEAD SECTION AND EXTENSION SECTION (TYPICAL)



HELICAL LEAD SHAFT SECTION



HELICAL EXTENSION SHAFT SECTION

Note:

- For the TS278203 helical pile, wall thickness of lead section (TL278203) and extension section (TE278203) is 0.203 inch (5.156 mm).

2$^{7}/_{8}$X0.203 inch Helical Pile (TS278203)

FIGURE 3—HELICAL LEAD SECTION AND EXTENSION SECTION (TYPICAL) … ***Cont'd***

ICC-ES Evaluation Report

ESR-3982 City of LA Supplement

Issued June 2026

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

REPORT HOLDER:

HELICAL ANCHORS, INC.

EVALUATION SUBJECT:

HELICAL ANCHORS HELICAL FOUNDATION SYSTEMS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Helical Anchors helical foundation systems, described in ICC-ES evaluation report ESR-3982, have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2026* *City of Los Angeles Building Code* (LABC)
- 2026**City of Los Angeles Residential Code* (LARC)

*For evaluation for compliance with the anticipated requirements of the 2026 LABC and LARC

2.0 CONCLUSIONS

The Helical Anchors helical foundation systems, described in Sections 2.0 through 7.0 of the evaluation report ESR-3982, comply with the LABC Section 1810, and the LARC, and are subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Helical Anchors helical foundation systems described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-3982.
- The design, installation, conditions of use and identification of the Helical Anchors helical foundation systems are in accordance with the 2024 *International Building Code®* (IBC) provisions noted in the evaluation report ESR-3982.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, and Sections 1803 and 1803.1.5, as applicable.
- The Helical Anchors helical foundation systems may be used in new construction and to resist horizontal loads as an exception to LABC Section 1810.3.1.5, provided the following conditions are followed:
    - The Helical Anchors helical foundation systems must comply with the provisions in ESR-3982 that apply to installation in Seismic Design Categories D, E and F.
    - A soil investigation report as required by LABC Section 1803.1 shall be submitted to the Los Angeles Department of Building and Safety Grading Division for review and approval for each site where helical piles are installed.
    - For installation of helical piles under LABC covered structures, axial and lateral (where used) capacities of helical piles shall be determined in accordance with LABC Section 1810.3.3 by at least two project specific preproduction tests for each soil profile, size and depth of helical pile. At least two percent of all production piles shall be proof tested to the design strength, determined by using load combinations in LABC Section 1605.2.

- For installation of helical piles under LARC covered structures, axial and lateral (where used) capacities of helical piles shall be determined in accordance with LABC Section 1810.3.3 by at least two project specific preproduction tests for each soil profile, size and depth of helical pile. At least two percent of all production piles shall be proof tested to the design strength, determined by using load combinations in LABC Section 1605.2.
- Helical piles installation shall be performed under the inspection and approval of the soils engineer and the continuous inspection and approval of the deputy grading inspector. The information recorded shall include installation equipment used, pile dimensions, tip elevations, final depth, final installation torque and other pertinent installation data as required by soils engineer.
- Helical piles shall satisfy corrosion resistance requirements of AC358. In addition, all helical pile materials that are subject to corrosion shall include at least 1/16-inch corrosion allowance.
- The allowable axial design load must comply with LABC Section 1810.3.3.1.9.
- The allowable lateral load must comply with ESR-3982. The seismic demand force must not exceed the allowable lateral load reported in ESR-3982.

- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.

This supplement expires concurrently with the evaluation report reissued September 2025 and revised June 2026.

ICC-ES Evaluation Report

ESR-3982 CA Supplement

Reissued September 2025

Revised June 2026

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

REPORT HOLDER:

HELICAL ANCHORS, INC.

EVALUATION SUBJECT:

HELICAL ANCHORS HELICAL FOUNDATION SYSTEMS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Helical Anchors Helical Foundation Systems, described in ICC-ES evaluation report ESR-3982, have also been evaluated for compliance with the code noted below.

Applicable code edition:

- 2025 *California Building Code®* (CBC)

For evaluation of applicable chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) AKA: California Department of Health Care Access and Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

- 2025 *California Residential Code®* (CRC)

2.0 CONCLUSIONS

2.1 CBC:

The Helical Anchors Helical Foundation Systems, described in Sections 2.0 through 7.0 of the evaluation report ESR-3982, comply with CBC Chapter 18, provided the design and installation are in accordance with the 2024 *International Building Code®* (IBC) provisions noted in the evaluation report and the additional requirements of CBC Chapters 16, 17 and 18, as applicable.

2.1.1 OSHPD:

The applicable OSHPD Sections and Chapters of the CBC are beyond the scope of this supplement.

2.1.2 DSA:

The applicable DSA Sections and Chapters of the CBC are beyond the scope of this supplement.

2.2 CRC:

The Helical Anchors Helical Foundation Systems, described in Sections 2.0 through 7.0 of the evaluation report ESR-3982, comply with CRC Chapter 3, provided the design and installation are in accordance with the 2024 *International Residential Code®* (IRC) provisions noted in the evaluation report.

This supplement expires concurrently with the evaluation report, reissued September 2025 and revised June 2026.

ICC-ES Evaluation Report

ESR-3982 FL Supplement w/ HVHZ

Reissued September 2025

Revised June 2026

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

REPORT HOLDER:

HELICAL ANCHORS, INC.

EVALUATION SUBJECT:

HELICAL ANCHORS HELICAL FOUNDATION SYSTEMS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Helical Anchors Helical Foundation Systems, described in ICC-ES evaluation report ESR-3982, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2023 *Florida Building Code—Building*
- 2023 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The Helical Anchors Helical Foundation Systems, described in Sections 2.0 through 7.0 of ICC-ES evaluation report ESR-3982, comply with the *Florida Building Code—Building* and the *Florida Building Code—Residential*. The design requirements must be determined in accordance with the *Florida Building Code-Building* or the *Florida Building Code-Residential,* as applicable. The installation requirements noted in ICC-ES evaluation report ESR-3982 for the 2021 *International Building Code®* meet the requirements of the *Florida Building Code—Building* or the *Florida Building Code—Residential,* as applicable, with the following condition:

- Design wind loads must be based on Section 1609 and Section 1610 (for High-Velocity Hurricane Zones) of the *Florida Building Code—Building* or Section R301.2 of the *Florida Building Code—Residential*, as applicable.

Use of the Helical Anchors Helical Foundation Systems has also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* or the *Florida Building Code—Residential*.

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission). Florida Rule 61G20-3 is applicable to products and/or systems which comprise the building envelope and structural frame for compliance with the structural requirements of the Florida Building Code.

This supplement expires concurrently with the evaluation report, reissued September 2025 and revised June 2026.