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INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS
UNIFORM EVALUATION SERVICE

EVALUATION CRITERIA FOR

HELICAL PILES FOR USE UNDER THE INTERNATIONAL RESIDENTIAL CODE

EC027-2017
(Adopted November 2017)

1.0 INTRODUCTION

Helical piles are widely used in residential construction regulated under the IRC as foundation elements to transfer loads from new and existing buildings to the ground below. These foundation elements are installed to support residential structures, additions to residential structures, and ancillary and accessory structures such as sheds, decks, and porches.

1.1 Purpose: The intent of this criteria is to provide an acceptable path to justify recognition of helical pile foundation systems in evaluation reports reviewed and issued by an independent evaluation agency as an alternative to the IRC prescriptive foundation and footing requirements. This criteria provides for determination of the support capacity of helical pile foundation systems in residential applications when supplemental geotechnical evaluation is available, and for increased safety factor adjustments when no evaluation is available. In either case, a registered design professional shall review the relevant information and determine safe bearing values for the helical pile foundation systems using appropriate safety factors. When supplemental geotechnical information is considered in the design, the higher degree of certainty of sub-surface conditions allows for higher loading to be assigned to each pile. When supplemental geotechnical evaluation is not available, a degree of certainty nonetheless exists for bearing capacity determination, but in this case a higher safety factor may be appropriate. In both cases, soil bearing data that is based on the correlation between installation torque and bearing capacity, is acquired by the installation technician, analyzed by a design professional, and provided to the building official for approval.

Helical pile foundation systems may be considered by building officials, in accordance with IRC Sections R403.1 and R104.11, as other approved structural systems for use as foundations to support exterior walls and loads determined in accordance with IRC Section R301, and to transmit these loads to the ground. Building officials may approve helical pile foundation systems based on test data, calculations, and other documentation, such as evaluation reports, relating to their load carrying capacity.

1.2 Scope: This evaluation criteria applies to helical pile foundation systems with single helices used in residential occupancies built under the 2015, 2012, and 2009 International Residential Codes for recognition in an evaluation report issued by an approved evaluation agency accredited in accordance with ISO/IEC 17065. The foundation systems under this criteria are limited to vertical helical piles subject to maximum 45 kips (200 kN) allowable axial loading. The vertical seismic load carrying capacity of the helical pile foundation systems under this criteria is limited to loads in Seismic Design Categories A, B, and C unless design calculations and details are submitted justifying the seismic load bearing capacity of the helical pile foundation systems under Seismic Design Categories D_0, D_1, and D_2, and E. The allowable lateral load resistance capacity of the helical pile foundation systems shall be determined by a registered design professional in a manner acceptable to the building official.

1.3 Definitions: For terms not defined in this section, applicable codes, or referenced standards shall have the ordinary accepted definition for the context for which they are intended.

1.3.1 Helical Pile Foundation (HPF): A factory-manufactured steel foundation that consists of a steel shaft, single or multiple steel helices (e.g. bearing plates), and a steel cap or bracket that connects the shaft to the structure above. Each bearing plate is pitched into a screw thread pattern. The HPF may or may not have shaft extensions and manufactured shaft couplings that connect individual shaft sections together. HPF's are rotated into the ground using torsion applied by a calibrated machine until a desired bearing depth and installation torque is achieved.

1.3.2 HPF Cap: A factory-manufactured steel device that connects the HPF shaft to the structure above. The cap may be bolted, welded, screwed, encased in concrete, or otherwise attached to the HPF shaft and structure above such that it applies concentric axial loads to the HPF shaft. Generally, HPF caps are used for new construction applications.

1.3.3 HPF Bracket: A factory-manufactured steel device that connects the HPF shaft to the structure above. The bracket may be bolted, welded, screwed, or otherwise attached to the HPF shaft and structure such that eccentric axial loads are applied to the HPF shaft and/or structure. Generally, HPF brackets are used for repair or strengthening of existing structures and placement to achieve concentric loading is not possible.

1.3.4 Conventional Design: Determination of HPF design capacities using accepted engineering standards and methods such as ACI 318, AISC 360, and the National Design Specification for Wood Construction (NDS).

1.3.5 Torque Correlation: An empirical relationship between installation energy and HPF capacity, whereby the HPF ultimate geotechnical bearing capacity is proportional to the installation torque needed to drive (or twist) the HPF into the ground. The torque correlation factor, also known as the torque-to-capacity ratio, is determined for each HPF system in accordance with Section 4.3.4.

1.3.6 Final installation Torque: The final installation torque shall be based on the manufacturers installation instructions.

2.0 REFERENCED STANDARDS

Standards shall be applied consistent with the specific edition of the code(s) for which the Evaluation Report is prepared unless otherwise approved by UES.

2.1 American Concrete Institute

- Building Code Requirements for Structural Concrete, ACI 318-14
- Building Code Requirements and Specification for Masonry Structures, ACI 530-13

2.2 American Society for Testing and Materials

- Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products, ASTM A123-15
- Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel, ASTM B633-15
- Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel, ASTM B695-04(2016)
- Standard Test Methods for Deep Foundations Under Static Axial Compressive Load, ASTM D1143-07(2013)
- Standard Test Methods for Deep Foundations Under Static Axial Tensile Load, ASTM D3689-07(2013)

2.3 International Code Council

- International Residential Code, IRC, 2015, 2012, 2009
- International Building Code, IBC, 2015, 2012, 2009

2.4 American Institute of Steel Construction

- Specification for Structural Steel Buildings, AISC 360-10

2.5 American Wood Council

- National Design Specification (NDS) for Wood Construction, ANSI AWC NDS-2015

2.6 American Iron and Steel Institute

- North American Specification for The Design of Cold-Formed Steel Structural Members, AISI S100-12

3.0 BASIC INFORMATION

3.1 Description: The following information and data shall be submitted for review and evaluation for recognition of HPF systems in an evaluation report:

3.1.1 Product Description: A complete description of the helical piles and accessories shall be submitted. The description shall include all models and specifications such as shaft lengths and diameters, helix sizes, helix pitches and leading-edge configurations, as well as extension and coupler descriptions and specifications, and models and specifications for the HPF caps and brackets. The applicable steel standards and specifications such as steel thicknesses, galvanization specifications, and welding specifications shall also be provided.

3.1.2 Installation Instructions: The manufacturer's published installation instructions shall be provided. The description shall include all applicable installation requirements and descriptions of the installation machinery. The instructions shall require that installers be trained and approved by the helical pile system manufacturer.

3.1.3 Packaging and Identification: The method of identifying the HPF systems shall be submitted. At minimum, the company name, product name, model number, evaluation report number and evaluation agency mark of conformity shall be included in the product identification.

3.2 Test Reports: Reports shall be provided justifying the geotechnical capacities of the HPF systems based on the torque correlation factors achieved in field-testing. Tests may also be used as alternatives to engineering calculations to justify the capacities of various structural elements in the systems. A testing plan shall be submitted to the evaluation agency for approval.

Test reports shall include all relevant data in accordance with the standards and the testing and performance requirements in Section 4 of this criteria.

3.3 Testing Laboratories: Laboratories shall be accredited as complying with ISO/IEC Standard 17025 for the testing conducted and reported (i.e. the laboratory's scope of accreditation shall include helical pile quality and capacity determination). The laboratory's accreditation shall be issued by an accreditation body conforming to ISO/IEC 17011 and that is a signatory of the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA).

3.4 Product Sampling: The test specimens shall be sampled or verified by an accredited inspection agency or testing laboratory. The sampled product shall be representative of the production ongoing after the sampling has taken place. The product specifications shall be within the tolerance limits reported in the quality documentation and the relevant standards.

4.0 TESTING AND PERFORMANCE REQUIREMENTS

4.1 General: Testing and analysis shall be carried out on the HPF systems to determine their capacity to withstand the rigors of installation and their capacity to perform as intended to support the structures once installed. The load from the supported structure is transferred to each element of

the HPF system, in turn, beginning with the HPF cap or bracket connecting the structure to the helical pile shaft, then through the shaft and couplings or extensions (if any), to the weld connecting the helix to the pile shaft, through the helix, and finally to the supporting soil. This load path is valid whether the loads are in tension or in compression. The capacity of the HPF shall be based on the capacity of the weakest of the load transfer elements in the HPF system load path. Testing shall be performed and reported by testing agencies specifically accredited for the types of tests required by this criteria. Testing shall be provided in accordance with Section 1.3.1.3.2 of ASCE-7, and analysis shall be provided by registered design professionals in accordance with Section 1.3.1.3.1 of ASCE 7. The maximum allowable capacity of each of the elements of the system shall be determined and included in the evaluation report, for use by the installer, and for verification by the building official.

Capacity determination shall consider any effects of corrosion on the system. The helical piles shall be designed so that the effects of corrosion shall not reduce the base steel integrity beyond 67 percent at the end of the 50-year projected service life of the structure. A zinc coating inside and out in accordance with ASTM A123 is considered acceptable protection for a ¼-inch-thick-wall tubular steel helical pile.

4.2 **Capacity determined by analysis**: The capacity of some of the elements may be determined by conventional analysis in lieu of testing. Where testing is used to qualify these elements, the testing shall be in accordance with a testing plan approved by the evaluation agency. For these elements, the design loads shall be determined using the applicable provisions of the IRC, IBC, and ASCE 7 and AISC 360, and analysis shall be done in accordance with the applicable design standard. These elements include the HPF cap or bracket and its connection to the supported structure, the shaft in pure compression and tension, the coupling and its connection to both upper and lower shaft sections, and the weld connecting the helix to the shaft. The axial compression capacity analyses shall account for any eccentricity due to manufacturing tolerances in the coupling, and to coupling rigidity.

4.2.1 **Analysis**: Allowable ASD capacities for the structural elements (i.e., HPF caps or brackets, connections, shafts, couplings, helices, welds, etc.) in the HPF systems shall be based on engineering analysis incorporating the applicable safety factors described in the relevant codes and standards listed below, or equivalent, and in the relevant sections of this criteria. Justification for the torque correlation factors shall be provided. The material standards used for analysis of elements of the support systems described in this criteria, are those incorporated by reference in the IRC, and include AISC 360, ACI 318, ACI 530, ANSI AWC NDS, AISI S100.

4.3 **Capacity determined by testing:** The following aspects of the HPF system are required to be determined through testing: the strength of the helix, the maximum installation torque rating for the helical pile system, and the HPF system torque correlation factor (see Section 4.3.4).

4.3.1 **Coupling Rigidity:** Coupling rigidity shall be determined by examining the difference between the average deflection for a minimum of three to a maximum of six tests (per section 1.3.1.3.2 of ASCE-7) of HPF shafts containing couplings to one single shaft without couplings. All test specimens shall be at least 10 feet in length. Shafts with couplings shall have the maximum number of couplings that could occur in use for this length of pile. One end of the shafts shall be connected to achieve a near fixed-end condition, and a test load equal to at least 0.4 percent of the tested allowable HPF shaft axial capacity shall be applied perpendicular to the shaft axis at the opposite (free) end. If applicable, additional tests shall be conducted with different orientations (set-up) of the coupler with respect to the direction of the applied load to produce the largest deflection possible. This deflection shall be used in the determination of coupling eccentricity. The coupling eccentricity shall be equal to the difference in between the average deflection of samples with couplings to the sample without couplings. Couplings fully welded to the shafts in accordance with the applicable codes, or other similar couplings that are proven by rational analysis to achieve full bending strength and stiffness, shall be considered to develop no significant eccentricity to the HPF shaft.

4.3.2 Helix Capacity: Helix capacity shall be determined to verify the weld strength connection between the helix and the shaft as well as the capacity of the helical plate to carry the building loads and transfer these loads to the soil. For each shaft size, if the helix material strength, helix steel thickness, weld specification, and helix pitch are substantially similar for all helices, then the helix capacity tests may be performed in accordance with one of the following two methods. For any helix with any specification (mentioned above) that is substantially different from the others, the helix capacity tests shall be conducted in accordance with Method 1 in Section 4.3.2.1 of this criteria.

4.3.2.1 Method 1: A minimum of three tests shall be performed for each nominal helix diameter. If each individual test result is within 15% of the average ultimate test result, the helix ultimate capacity shall be the average of the test results. If any test result is more than 15% from the average, the least test result shall be used as the ultimate capacity or additional tests, up to a maximum of six tests, may be performed and then the average result may then be used. Once the ultimate capacity has been determined as stated above, the allowable helix capacity shall be determined using a safety factor of 2.0.

4.3.2.2 Method 2: A minimum of three tests shall be performed on the largest nominal helix diameter. If each individual test result is within 15 percent of the average peak test result, the helix ultimate capacity shall be the average of the test results. If any test result differs more than 15 percent from the average peak test result, the least test result shall be used as the peak capacity or additional tests, up to a maximum of six tests, may be performed and then the average result may then be used. Once the peak capacity has been determined as stated above, the allowable helix capacity for the largest diameter and any smaller diameter shall be determined using a minimum safety factor of 3.0.

Helix capacity is tested by applying a load slowly through the shaft to the helix plate, which reacts against a specially constructed jig that matches the helix shape. The reaction against the helix plate is at 2/3 the helix radius from the pile axis (or 1/3 the helix radius from its outer edge) and it simulates the reaction of the soil encountered in use. The helix capacity test shall be required to be run in one axial direction only, provided the helix is similarly welded on both sides (symmetrical). The helix peak capacity shall be taken as the maximum applied load resisted by the sample during testing

4.3.3 Validation of Torque Rating: The torsion capacity of the model specific helical pile assembly shall be determined through testing to provide a maximum installation torque to which the helical pile may be subjected to in the field.

Each test sample shall be a minimum of 5 feet (1.5 m) in length, have a helix, a coupling (if couplings are included in the application), and the manufacturer recommended pile installation attachment system (drive pins, for example). The testing agency shall record the actual sample dimensions including length, cross-section, and minimum yield and ultimate stresses as reported in the mill certificates for the steel used to manufacture the HPF systems.

At a minimum, the sample set for each shaft size shall include at least six test specimens. At least three test specimens for each nominal helix size if multiple helix sizes are being evaluated. For each specimen, the test rated torque and failure mechanism shall be recorded. The test rated torque for each specimen shall be the applied torque to the specimen that causes 0.25 inches deformation at drive pin or coupling bolt holes, the torque that causes permanent shaft rotation of 0.5 revolutions per foot, or the torque that causes a failure of the specimen, whichever occurs first. The final test rating torque shall be the average of all test results. The maximum installation torque shall be the final test rating torque reduced by a rational analysis comparing the sample cross sectional and strength properties to the minimums permitted by the manufacturer's quality program. This reduction analysis may be performed by the testing agency, or by a registered or licensed design professional, with results subject to the approval of the evaluation agency.

4.3.4 Geotechnical Load-Bearing Capacity: Determination of the torque correlation factor,

K_t (ft^{-1}), for each shaft size shall be based on the average of the full-scale load test results using a minimum safety factor, FS=2.0, where K_t is the ratio of the load test result divided by the final installation torque, and FS is the ratio between the measured pile capacity in the field to the allowable predictable capacity based on torque. For the K_t obtained from the average test results to be valid, the FS of each test shall be equal to or larger than 1. If not, then the K_t value shall be reduced until this criteria is met. K_t shall also not exceed the value obtained using the following formula based on the shaft diameter, D_s, or the other industry accepted values for specific shaft sizes shown below, and less than or equal to 10 (ft^{-1}):

$K_{tmax} = 22.285 \times Ds^{-0.9195}$ (from Helical Piles A Practical Guide To Design and Installation by Howard A. Perko, PhD, PE, John Wiley & Sons, Inc.)

Industry Accepted Values	
1.5-inch and 1.75-inch square shafts	$K_t = 10$
2.875-inch outside diameter shafts	$K_t = 9$
3.0-inch outside diameter shafts	$K_t = 8$
3.5-inch outside diameter shafts	$K_t = 7$

4.3.5 Full Scale Load Testing: For each shaft size for which recognition is sought, a minimum of six single helix, full scale load tests shall be performed. If evaluation is sought for more than one helix size, there shall be at a minimum, one full scale load test per helix size. Testing shall include both compression and tension directions if both directions are being evaluated. The full-scale load tests may be performed in any soil type (i.e. clay, sand, or weathered bedrock). Two test piles shall be installed to at least 90 percent of the maximum installation torque; one with the smallest and one with the largest helix size. The remaining full-scale load tests may be installed to any torque acceptable to the testing agency with the intent of spreading installation torques throughout the installation torque range as much as practicable. Helix depths shall not be less than 5 feet (1.5 m) or to a depth needed to include a coupling, if couplings are included in the application.

Testing shall be performed in general agreement with ASTM D1143 and ASTM D3689, respectively, for compression and tension capacity determination. The ultimate pile capacity shall be determined using the net deflection at 10 percent of the helix diameter. Net deflection is defined as the total deflection minus the shaft elastic shortening or lengthening.

5.0 DESIGN

The HPF systems shall be designed to determine the allowable bearing capacities for the helical piles based on the appropriate ratings determined above in the field. The load bearing capacity of the helical pile depends partly on the bearing capacity of the various soils at the locations where the supported structures are situated, and partly on the capacity of the pile assembly itself. The soil bearing capacity is arrived at by applying the torque correlation factor to the torque required to install the pile in the soil at the structure location. The model of helical pile is chosen based on its capacity and the capacity of each element in the helical pile assembly to support the demand load from the supported structure. The installer then installs the helical pile until the required minimum depth and torque are reached.

5.1 Design Loads: The design of helical pile foundations begins with determination of the demand loads. The structural loads shall be determined in accordance with Section R301 of the IRC using appropriate load combinations shown in the IBC or ASCE 7. The demand loads shall be included in the pile capacity reports given to the building official.

5.2 Cap or Bracket Capacity: The capacity of the HPF cap connecting the supported structure to the pile shaft shall be determined by analysis using accepted engineering standards and practice. Connection of the pile cap to the supported structure and to the helical pile shaft shall be considered in the design.

5.3 Shaft Structural Capacity: The ASD shaft axial capacity shall be determined using accepted

engineering analysis and shall account for corrosion loss. The steel used in helical pile shafts shall not be stressed more than 0.5 F_y.

Portions of helical pile shafts not buried in the ground, or piles extending through water or fluid soils shall be designed as columns. Pile heads shall be considered free, pinned, or fixed depending on the specific conditions of connections to the structure they support. Any soil other than fluid soil shall be deemed to afford sufficient lateral support to prevent buckling and to permit the design of the shaft as fully braced. When shafts extend in air, water, or fluid soils they shall be considered fixed and laterally supported at a point 5 feet (1524 mm) into firm soil or 10 feet (3048 mm) into soft soil. Distances to fixity shorter than this may be permitted if based upon analysis by a design professional and subject to the approval of the building official. Pile axial structural capacity shall consider coupling eccentricity and rigidity. Welds in compression shall be considered and worst-case situations due to manufacturing tolerances shall be analyzed.

The axial tension capacity analysis of the helical pile shall account for any reduced steel cross section where bolts, pins, etc., are used in the coupler connection. Welds in tension shall be considered and worst-case situations due to manufacturing tolerances shall be analyzed.

5.4 Coupling Capacity: The capacity of the coupling when subjected to compression, tension, shear, and bending loads shall be determined by conventional analysis using the net section of the steel or by a testing plan accepted by the certification body. Coupling rigidity shall be considered in axial buckling evaluations. Coupling rigidity is to be determined by testing per Section 4.3.1.

5.5 Soil Bearing Capacity: The soil in which the helix is installed shall be undisturbed native soils or engineered fill. Where compressible, expansive, or otherwise shifting soils are known to be present at the site, these soils shall be removed or helices shall be extended below the zone of deleterious materials. In accordance with IRC Section R401.4, the building official may require a soil test where the presence of questionable soil characteristics soils is likely.

The allowable axial soil bearing load, Pa, shall not exceed the allowable geotechnical resistance determined as follows:

$$Pa = Pu / FS$$

Where Pu is the least ultimate capacity determined by torque correlation (i.e., K_t x Final Torque) or area of helix times the ultimate bearing capacity of the layer in which it is bearing.

5.5.1 Capacity determination where supplemental geotechnical information is not available: Where there is no evidence of questionable soils at the level of the helix in the helical pile installation, torque correlation alone may be used to provide sufficient evidence of compression geotechnical capacity when the helical piles are installed. A minimum Safety Factor (FS) of 2.5 shall be applied to determine the compressive load bearing capacity of the pile.

Exception: Where the helical piles are installed to support decks, accessory structures, or additions of 600 square feet (55.7 m^2) or less for light-frame construction a minimum Safety Factor of 2.0 shall be applied for compression loads.

5.5.2 Compression capacity determination when supplemental geotechnical information is available: Where soil bearing characteristics are known due to the availability of supplemental geotechnical information and helix sizes are based upon this information and torque is also monitored during installation, the Safety Factor for compressive loading shall be a minimum of 2.0.

5.5.3 Tension capacity determination: Helical pile tension capacity shall be determined using a Safety Factor of 2.5 or greater. Helices shall be embedded to a minimum depth at which a shallow pull out failure does not control the tension capacity. An uppermost helix depth of 12 times the average helix diameter (12D) shall be considered sufficient embedmentto establish a reliable soil bearing capacity for tension loading that is based on installation

torque. At shallower depths, tension capacity shall be verified by analysis considering the weight of soil above the uppermost helix.

5.6 Pile Lateral Capacity: The allowable lateral load capacity of each pile is out of the scope of this criteria. The lateral load capacity may be determined by site specific load testing. As an alternative, capacity may be determined using an acceptable analysis method. Where field tests are required to confirm the capacity of a helical pile installation, these tests shall be supervised by a registered design professional.

5.7 Required Field Reporting: HPF systems shall be installed by installers who are trained and approved by the HPF system manufacturer, using manufacturer-approved equipment. The equipment calibration shall be recent. Installers shall record all pile locations and types including shaft diameters, helix sizes, embedment depths, and final torque readings. In addition, for at least one out of every ten piles in multi-pile installations, a torque profile shall be recorded. A field report containing this information, along with relevant details of the supported structure, the types of HPF caps or brackets used, and details of all field connections, including field welds, shall be reviewed by a registered design professional, and submitted to the building official for approval.

6.0 QUALITY CONTROL

6.1 Quality documentation complying with the UES Minimum Requirements for Listee's Quality Assurance System (UES-010) shall be submitted. A complete description shall be provided of the quality management system used in the factory to manufacture the helical piles to meet minimum specifications and tolerances.

6.2 A complete description shall be provided of the quality management system used in the field to achieve a reliable allowable bearing capacity for each pile, and the oversight mechanisms used by the manufacturer to monitor this system.

6.3 The quality management system shall include a method to calibrate the torque indicators and verify calibration of the installation equipment to validate the axial capacities of the piles based on the recognized torque correlation factors per Section 4.3.4.

6.4 Inspections of manufacturing facilities are required for this product, by agencies accredited for the required tasks in accordance with ISO/IEC 17020 or ISO/IEC 17065.

7.0 EVALUATION REPORT RECOGNITION

Evaluation reports shall include the following information:

7.1 The evaluation report shall include a statement that the helical piles shall be installed to a depth sufficient to develop adequate bearing and below frost line.

7.2 The evaluation report shall include a statement that the allowable compressive load on the helical piles shall not exceed 45 kips (200 kN).

7.3 The evaluation report shall tabulate the maximum allowable loads and optionally LRFD loads.

7.4 The evaluation report shall state that in accordance with IRC Section R401.4, the building official may require a soil test where the presence of questionable soil characteristics such as expansive, compressible, or shifting soils is likely, based on quantifiable data.

7.5 Drainage shall be directed away from the pile support locations. Where helical piles are installed on or adjacent to slopes, the negative effects of drainage, erosion, and shallow failures shall be avoided in accordance with R403.1.7.

7.6 The evaluation report shall include a statement that portions of helical pile shafts not buried in the ground shall be designed as columns in accordance with IBC.

7.7 The evaluation report shall include a statement that lateral load capacity may be determined by site specific load testing or using another analysis method acceptable to the building official.

7.8 The evaluation report shall state that the helical piles shall be installed in accordance with the manufacturer's installation instructions by manufacturer certified installers.

7.9 The evaluation report shall state that the trained and approved installer shall submit an engineering field report to the building official within 10 days after helical pile installation. The report shall describe the type of project, sketch or drawing of the support situation with dimensions, pile shaft and helix sizes, height of the top of the shaft, bracket or cap system used, final depth of the helix, torque readings, safe allowable load geotechnical capacity based upon torque correlation factor, and other relevant notes or comments as needed.

7.10 The evaluation report shall state that the supported structure shall be adequately anchored to the tops of the helical piles.

7.11 Unless design calculations and details are submitted justifying use in higher seismic design category locations, the evaluation report shall state that the helical pile foundation system has not been evaluated for use in locations where the seismic design category exceeds SDC C.

7.12 The evaluation report shall state that where field tests are required to confirm the capacity of a helical pile installation, these tests shall be supervised by a registered design professional.

7.13 The evaluation report shall state that the spacing between helical piles shall be minimum 3 times the diameter of the largest helix in adjacent piles.

7.14 The evaluation report shall state that the pile shaft shall be within 3 degrees of vertical when installation is complete.

7.15 The evaluation report shall include a statement informing designers, users, and building officials that the capacity of the supported structure to span the distance between helical piles is outside the scope of the report.