



SECTION 552 HELICAL ANCHORS AND HELICAL PILES

DESCRIPTION

552.01 This work pertains to furnishing and installing helical anchors and helical piles shown in the Contract in accordance with the Drawings and these specifications. Each helical anchor and helical pile shall be installed at the location and to the elevation, minimum length, and installation torque indicative of the design allowable capacities shown on the Plans or as established. In addition, helical piles and helical anchors shall be load tested and post-tensioned as specified. These specifications are to be used in conjunction with Federal Highway or State Department of Transportation Standard Specifications for Road and Bridge Construction.

MATERIALS

552.02 Guarantees and Insurance

Helical anchor and helical pile manufacturer shall furnish a guarantee for a period of ten (10) years from date of delivery against defects due to manufacturing of helical anchors, helical piles, and bracket assemblies. Helical anchor and helical pile manufacturer must carry product liability insurance. Refer to General Conditions for additional insurance requirements.

552.03 Prequalification Requirements

Due to the special requirements for design and manufacture of helical anchors and helical piles, and the requirements for proper performance of the structural system, as a whole, helical anchors and helical piles shall be obtained from an organization specializing in the design and manufacture of helical anchors and helical piles. The following manufacturers' products are prequalified for use on this project:

Magnum Piering, Inc.

A request for using any other manufactured helical anchor and helical pile products desired for use on this project must be submitted to the Project Manager and Foundation Engineer for review not less than seven (7) calendar days prior to the bid date. The request must include:

1. A catalog or recent brochure describing the manufacturer.
2. Evidence showing manufacturer has at least ten (10) years experience in this area of work.
3. Current ISO 9001:2008 certificate and ICC-ES product evaluation reports.

Prior to bidding by any installer using a manufactured helical anchor and helical pile system that is not prequalified, written approval to bid must be received from the Project Manager upon consultation with the Foundation Engineer. Project Manager shall grant approval based on compliance with specific criteria herein. The Project Manager's decision is final.

552.04 Minimum Material Requirements

Helical anchor and helical piles shall have a tubular round shaft and shall have the required number of helical blades so as to provide for adequate load carrying capacity. The strength of the helical blades, shaft connections, bracket assembly, and the shaft itself shall be sufficient to support the design loads specified on the Plans. Helical anchors, helical piles, and bracket assemblies shall be designed in accordance with modern standards for steel construction. Design capacity shall take into account corrosion over a 75 year design lifespan. Helical piles and helical anchors shall be protected from corrosion by hot-dip galvanizing per ASTM A123 or A153, as applicable.

The helical anchor and helical pile shaft connections shall be in-line, straight and rigid and shall have a maximum tolerable slack of 1/16-inch or as acceptable to Foundation Engineer. Bolts used to join helical anchor and helical pile sections at the shaft connections shall be zinc coated or galvanized and shall be the grade and size specified by the helical anchor and helical pile manufacturer. All helical anchor and helical pile bolts shall be securely snug tightened.



Helical anchors shall be fitted with an adjustable bracket assembly that facilitates both post-tensioning and proof load testing. Helical piles shall be fitted with a manufactured bracket assembly rated for the design loads shown on the Plans and the strength of the concrete or other structure they support.

MATERIAL SELECTION

552.05 Design and Application

A list of all helical anchor, helical pile, and bracket materials to be used on this project shall be submitted with the bid package. The list shall clearly state the allowable mechanical capacity of all materials. The list shall be certified by the manufacturer's engineer. It is the helical anchor and helical pile installation contractor's responsibility to select the appropriate size and type of helical anchors, helical piles, and bracket assemblies. These specifications and the Plans provide minimum requirements to aid the contractor in making appropriate materials selections. The size and number of helical blades must be such that the helical anchors and helical piles achieve the appropriate torque and capacity in the soils at this site within the minimum and maximum length requirements. Failure to achieve proper torque and capacity shall result in contractor replacing helical anchors and helical piles as appropriate to support the required loads. All installation procedures, materials, and replacements shall be acceptable to Foundation Engineer.

CONSTRUCTION REQUIREMENTS

552.06 Warranty and Insurance

Helical anchor and helical pile installation contractor shall furnish a warranty for a period of ten (10) years from date of installation against defects due to workmanship on installation of helical anchor, helical pile, and bracket assemblies. Helical anchor and helical pile installer must carry general liability insurance. Refer to General Conditions for additional insurance requirements.

552.07 Prequalification Requirements

Due to the special requirements for installation of helical anchors and helical piles, and the requirements for proper performance of the structural system, as a whole, helical anchors, helical piles, and bracket assemblies shall be installed by an organization specializing in the installation of helical anchors and helical piles. The following installation contractors are prequalified for work on this project:

< Insert Name of Authorized Magnum Installer Here >

Any other contractor desiring to bid as the helical anchor and helical pile installer for this project shall submit a request to the Project Manager and Foundation Engineer for review not less than seven (7) calendar days prior to the bid date. The request must include:

1. A recent company brochure indicating experience in this type of work.
2. Evidence of having installed helical anchors and helical piles on at least ten (10) projects, including project name, location, and client contact information.
3. Detailed description of helical anchors and helical piles, brackets, and connections of bracket to structure proposed for use on this project.
4. Proposed method of installation/ load testing pile and bracket.

Prior to bidding by any installer that is not prequalified, written approval to bid must be received from the Project Manager upon consultation with the Foundation Engineer. Project Manager shall grant approval based on compliance with specific criteria herein. The Project Manager's decision is final.

552.08 Installation Equipment

Each helical anchor and helical pile shall be advanced into the ground by application of rotational force using a hydraulic torque converter. Installation equipment shall include a direct means of determining the installation torque being applied to the helical anchor and helical pile. Where post-tensioning and capacity testing are required, installation equipment also shall include a means for applying and measuring loads and deflections of helical piles and helical anchors. Acceptable methods of post-tensioning and load testing include a calibrated hydraulic jack or other means acceptable to the Foundation Engineer. Current evidence of calibration of Contractor's load testing, post-tensioning, and torque monitoring equipment shall be provided upon request of Foundation Engineer.



552.09 Equipment and Material Acceptance

All helical anchor and helical pile installation equipment and materials shall be acceptable to the Foundation Engineer prior to delivery to the site. Acceptance will be based upon submission of records and data, as discussed in Sections 552.02 through 552.08. Once accepted, changes in installation equipment and materials will not be permitted without additional acceptance, and will be considered only after Contractor has submitted any and all information requested by Foundation Engineer.

552.10 Installing helical Anchors and helical Piles

Loads shown on the Plans are unfactored design loads. A minimum factor of safety of 2.0 shall be used to determine the required ultimate tensile capacity of the helical anchors and compressive capacity of helical piles with regard to their interaction with soil and bedrock. Helical anchor and helical pile capacity in soil and on bedrock depends on the geometric configuration of the helical blades about the lead section and the subsurface conditions. The torque applied during installation provides an indirect verification of axial capacity. Manufacturer's recommendations should be followed regarding the torque and the tensile/bearing capacity relationship for the particular helical anchor and helical piles selected. The number and size of blades shall be determined by the Contractor so as to achieve the required torque and tensile/bearing capacity for the soil conditions at the site. However, the ratio of design allowable capacity to the total area of the helical blades shall not exceed the allowable subsurface material bearing capacity.

Helical anchors and helical piles shall be advanced into the ground until the required torque is achieved to accommodate the ultimate tensile and bearing capacity plus an additional distance to ensure proper embedment. For the helical anchors, the embedment length shall be achieved by continuing advancement while maintaining or exceeding the required torque for a distance of at least three (3) feet. For the helical piles on bedrock, the embedment length shall be that required to achieve practical refusal.

Constant normal pressure shall be applied while screwing helical anchors and helical piles into the ground. The pressure applied shall be sufficient to ensure that, during each revolution, the helical anchor and helical pile progress into the ground a distance equal to at least 80% of the blade pitch. Rate of helical anchor and helical pile rotation shall not exceed 20 revolutions per minute.

The minimum and maximum length of the helical anchors shall be as shown on the Plans. The minimum length of the helical piles shall be such that the lowest helical bearing plate is at or below the elevation of the bearing stratum shown in the soil borings contained in the Geotechnical Report. The minimum depth of helical anchors below ground surface shall be 5 times the largest helix diameter. The minimum length of helical anchors behind a shoring or earth retention structure shall be this distance plus the distance behind the wall facing to the soil plane depicting the active earth pressure.

Helical anchors and helical piles shall be installed as close to the specified installation angle as possible. Tolerance for departure from installation angle shall be 5 degrees unless noted otherwise on the Plans.

Helical anchors, helical piles, and bracket assemblies shall be installed at the locations shown on the Plans. Tolerances for bracket assembly placement shall be 1" in both directions perpendicular to the anchor shaft and ¼" in a direction parallel with the anchor shaft unless otherwise specified.

All helical anchor and helical pile components including the shaft and bracket assembly shall be isolated from making a direct electrical contact with any concrete reinforcing bars or other non-galvanized metal objects since these contacts may alter corrosion rates.

552.11 Static Load Capacity Testing

A static load capacity test shall be performed on the helical anchors and helical piles after installation in accordance with the Plans. The static load capacity test shall be conducted one at a time and shall consist of the following. An initial axial setting force of 5,000 lbs shall be applied to the helical anchor or helical pile. Load increments of 10 to 15% of the design allowable load shall be subsequently applied with a constant time interval between each increment, in accordance with ASTM D 1143 Quick Load Test Method for Individual Piles, until the proof load



specified on the Plans is reached. After the final hold period, the maximum pile head displacement shall be recorded. The test shall be deemed successful provided helical anchor and helical pile maximum pile head displacement is less than three quarter (3/4) inch at the design load. In the event of an unsatisfactory test, the helical anchor or helical pile shall be installed to additional length and torque until a successful proof load capacity test has been completed. Axial load shall be applied to the helical anchor and helical pile during the proof load capacity test utilizing the final bracket assembly configuration. Through the duration of installation and testing, the horizontal movement of the structure to which the helical anchors are attached shall be limited as shown on the Plans.

552.12 Post-Tensioning

Upon completion of installation and proof load capacity testing, all helical anchors shall be post-tensioned in accordance with the Plans.

552.13 Field Modifications

Field welding, if required, shall be in accordance with the “Code for Welding in Building Construction” of the American Welding Society. Welding of galvanized steel can produce toxic gases and should be done in adequate ventilation and with appropriate gas detection, breathing gear, and other safety equipment per OSHA regulations. Modification of manufactured helical anchor and helical pile shaft, helical blades, bracket assemblies, and shaft connections is prohibited and shall not be performed without approval of product manufacturing company and acceptance by Foundation Engineer.

552.14 Quality Assurance Observation

Installation of helical anchors and helical piles shall be observed by Foundation Engineer or Foundation Engineer’s representative/agent to verify the length, final installation torque, proof load capacity tests, and post-tensioning. Contractor shall notify Foundation Engineer or Foundation Engineer’s representative/agent at least 24 hours prior to installation work.

METHOD OF MEASUREMENT

552.15 Helical anchors and helical piles will be measured on a per unit length basis with one unit equal to the equipment, materials, including bracket assembly, and labor required for proper installation and post-tensioning (if required) of one lineal foot of helical anchor or helical pile at the required final installation torque, capacity, location, elevation, and minimum length specified. Static load capacity testing will be measured on a per unit basis with one unit equal to the equipment, materials, including reaction piles and load frame, and labor required for obtaining a successful static load test.

BASIS OF PAYMENT

552.16 The accepted quantities will be paid for at the unit price per unit of measurement for each of the pay items listed below that appear in the bid schedule.



Payment will be made under:

Pay Item	Pay Unit
Helical Anchor and Bracket Assembly, Installed	per foot
Helical Pile and Bracket Assembly, Installed	per foot
Static Load Test, Successful	per test

Compensation will not be made for installation of helical anchors and helical piles where static load capacity tests failed to meet the required criteria. It is the Contractor's responsibility to select, furnish, and install the helical anchors and helical piles with the appropriate number and size of helical blades so as to achieve successful static load tests, to anticipate the required length of the helical anchor and helical piles, and include these costs in the bid price.