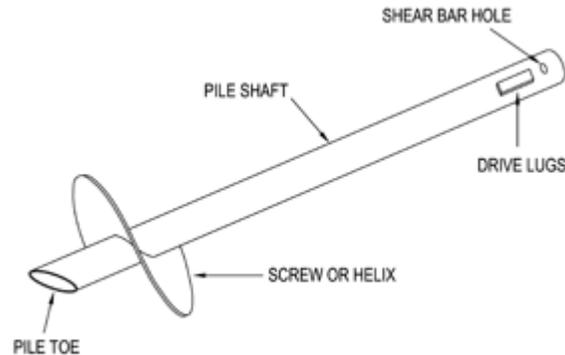


Helical Pier Basics

Q: What is a Helical Pier?

A: A helical pier or pile is an extendable deep foundation system with helical bearing plates welded to a central steel shaft. Load is transferred from the shaft to the soil through these bearing plates. The helical pier consists of segments or sections that are joined with bolted couplings. Central steel shafts are available in either Type SS (Square Shaft) series or Type RS (Round Shaft) series.



Q: What is the difference between a pile and a pier?

A: For Tella Firma purposes the words pile and pier can be used interchangeably. Helical piers can also be called screw piles, steel screw-in foundations, screw piers and screw foundations.

Q: What is the size of the central steel shaft?

A: The central steel shaft varies as a function of the required load that the pier must support. The square shaft (Type SS) series are available in 1-1/2" to 2" square sizes. The round shaft (Type RS) series are available in 2-7/8" to 4-1/2" diameter sizes.

Below are four Tella Firma helical pier models with various load capacities:

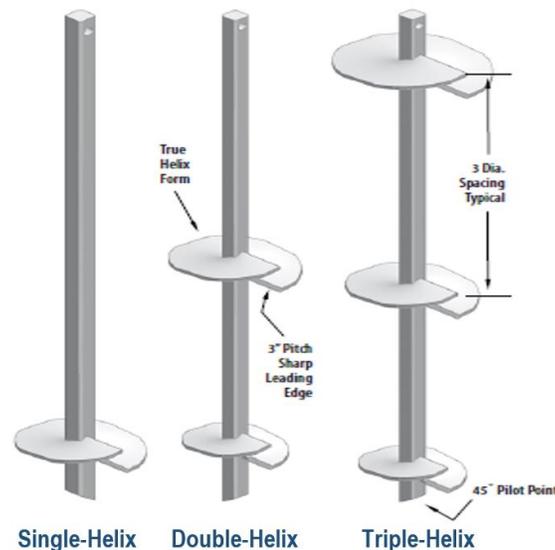
	<u>TF005</u>	<u>TF150</u>	<u>TF175</u>	<u>TF200</u>
Working Load:	28.5 kips	35 kips	50 kips	80 kips
Ultimate Load:	57 kips	70 kips	100 kips	160 kips

Q: What is the purpose of the helix plates and how many does each helical pier contain?

A: A helical bearing plate or helix creates a surface in the soil to support or carry the load of the pier. The helix plate is one pitch of a screw thread. All helices, regardless of their diameter, have a standard 3" pitch. Being a true helical shape, the helices do not auger into the soil but rather screw into it with minimal soil disturbance.

Helical plates are spaced at distances far enough apart that they function independently as individual bearing elements (typically 3X the helix diameter); consequently, the capacity of a particular helix on a helical anchor/pile shaft is not influenced by the helix above or below it. The typical helical pier has 2 or 3 helical plates, but can also have 1 or 4 plates depending on the soil conditions and load requirements. A typical 3-helix pier contains an 8", 10" and 12" diameter helix plate.

Example Lead Sections



Q: What are the benefits of a helical pier?

A: There are many benefits to using a steel helical pier including:

- Many times faster to install than concrete piers
- No waiting for concrete to cure / no pier spoils
- Suitable for sites with high water tables
- No costly surprises if water is encountered during pier drilling
- Installed with lightweight track loaders vs. heavy drilling rigs
- Installation less susceptible to weather delays vs. concrete piers
- Low-cost alternative to steel-cased concrete piers

Q: Why are helical piers "less susceptible to weather delays vs. concrete piers"?

A: Helical piers are installed with lightweight track loaders or skid-steer loaders. Because this equipment is much smaller & lighter than typical drill trucks, helical piers can be installed much sooner after a rain because they can drive onto a wet lot where a drill rig would have difficulty maneuvering on wet muddy soil.

Q: Can helical pier be installed in rainy weather?

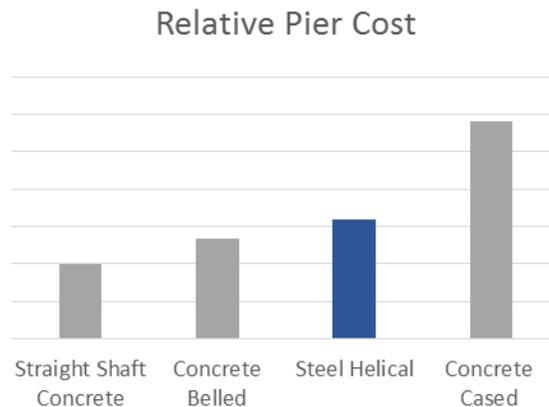
A: Helical piers can typically be installed during rainy weather, during breaks in the rain, or even in a light rain or mist. However, they cannot be safely installed during a thunderstorm or heavy rainfall. NOTE: Tella Firma's primary objectives are safety and quality.

Q: What are the disadvantages of a helical pier?

A: Helical piers are more expensive than a straight-shaft concrete piers, approximately equal to, or slightly higher in cost than a belled or under-reamed pier, but lower in cost than a cased concrete pier.

Q: What is the cost of a helical pier?

A: The cost of an installed helical pier is a function of the length (depth) of the helical pier and the load bearing capacity. Due to these variables, an installed helical pier can range in price from \$15-\$30 per foot (not including the stabilizing concrete cap). Therefore a typical 20 foot helical pier can cost in the range of \$300 - \$600 each.



Q: Are steel helical piers new?

A: Helical piers first appeared in the 1800s as pile foundations for lighthouses and were extensively used for piers in harbors. Between the 1850s through 1890s, more than 100 screw-pile lighthouses were erected on the east coast of the United States using screw piles. Made originally from cast or wrought iron, they had limited bearing and tension capacities. Today helical piers are used extensively in commercial application such as utility pole tensioners and foundation repair.

Q: What is Tella Firma doing different in the helical pier market?

A: Tella Firma is bringing the helical pier, together with its lifting mechanism to the mass market by providing builders a complete solution for affordable elevated foundations that protect the foundation against damage caused by active soils. Tella Firma is applying new technology and installation efficiencies to the new-construction market to improve the quality and reduce the cost.

Q: Does Tella Firma sell stand-alone helical piers without its lifting mechanism?

A: Tella Firma only markets helical piers as part of its complete foundation solution, however, in special strategic situations Tella Firma will sell helical piers without our lifting mechanisms.

Q: Does Tella Firma sell helical lifting mechanisms if the customer uses its own helical piers?

A: Yes. Tella Firma will sell both lifting mechanisms for concrete piers and helical piers, however, third-party purchased helical piers must meet the design specifications of the engineer-of-record and Tella Firma will not provide a helical pier warranty.

Helical Pier Installation

Q: How many helical piers can be installed in one day?

A: The number of helical piers that can be installed in a working day is a function of several factors including depth of pier installation, hardness of the soil, stickiness of the soil, whether or not the helical piers require an augured hole for concrete caps and of course, the number of installing rigs being used to install the piers. A good rule of thumb is that a single installation rig can install up to 40 average helical piers per day.

Q: Do helical piers work effectively in any type of soil?

A: Helical piers work differently in different types of soils for example clay soils vs. sandy soils.

Q: Do helical piers work effectively in clay soils? Sandy soils?

A: Yes. Helical piers work very effectively in most clay soils because the bearing capacity is a function of the bearing capacity of soils below the active zone and the cohesive factor of these soils. The higher the cohesive factor, the more effective the helical pier. Helical piers can also work very well in sandy soils, especially medium dense soils, however, due to the lack of cohesion of the sand, a larger helical plate or a great number of helical plates may be required to reach proper load bearing capacity.

Q: How deep are helical piers installed?

A: Proper helical pier depth is a function of the soil and the load requirement, but in general the depth can vary from 10 feet if shallow limestone is encountered to 40 feet in a heavily loaded pier. A typical helical pier depth for a single family foundation in DFW or Central Texas is 18–25 feet.

Q: How is the proper helical depth determined?

A: There are two main criteria for the depth that helical piers are installed; 1.) all the helical plates of the helical pier must be installed below the active soil line as determined by the geotechnical engineering soils test report, 2.) the helical piers must be installed to a depth such that the total bearing capacity of the helical pier meets the load requirements specification of the engineer designing the foundation including a safety factor.

Q: How do you assure that the bearing capacity of an installed helical pier will be sufficient to meet the load requirement specified by the foundation engineer?

A: Tella Firma engineers will typically use several methods. First the bearing capacity of a specific helical pier is calculated with a software program and then an actual field capacity test is performed in which a helical pier is installed and the torque is monitored to determine the proper depth to reach ultimate capacity.

Q: How do you make sure that the helical pier has proper lateral stability?

A: Tella Firma recommends that a lateral stabilizing device be installed with each helical pier. The most common lateral stabilizing device recommended is a concrete helical cap. The cap is created by pouring concrete around the top of the helical steel shaft providing lateral stability for the top of the pier. The cap is typically cylindrical and is specified to be at least 1 foot in diameter and at least 20 inches deep.

Technical Details

Q: Does Tella Firma follow published guidelines in determining helical pier capacity

A: Yes. Tella Firma follows the 2012 International Building Code Section 1810.3.3.1.9 which defines the methods for determining allowable axial load. Some of the methods include:

1. Sum of the areas of the helical bearing plates times the ultimate bearing capacity of the soil or rock comprising the bearing stratum (software program).
2. Ultimate capacity determined from the well-documented correlations with installation torque (field torque test).
3. Ultimate capacity determined from load tests.

One of the well-documented and widely accepted published papers on the subject is Relationship between Installation Torque and Axial Capacities of Helical Piles in Cohesive Soils. Mohammed Sakr, PhD., P.Eng published in the Deep Foundation Journal, Vol. 7 No. 1 August 2013.

Q: What is the published ratio of ultimate capacity to torque?

A: The published papers define various ratios that can be used, ranging as high as 14:1. Tella Firma prefers to err on the conservative side, therefore, we use the following ratios:

10:1 ratio of ultimate-capacity-to-torque for a solid square-shaft (SS) helical piers

9:1 ratio of ultimate-capacity-to-torque for a round-shaft (RS) (pipe) helical piers

Q: What is the difference between Ultimate Capacity and Working Capacity?

A: The ultimate capacity of a helical pier is the total axial capacity or load that the installed helical pier can bear before it yields or fails. The working capacity is the typical load that the helical pier will carry in the real-world environment. Typically the working capacity is determined by dividing the ultimate capacity in half to allow for a safety factor.

Q: What is torque?

A: Torque is the force required to rotate an object around an axis, in this case the rotational force to screw in a helical pier into the ground.

Q: How are these torque ratios used in a real-world situation.

A: Example:

The foundation engineer designs a foundation that contain piers specified to carry a working load of 30,000 lbs. (30 kip). The ultimate load is determined by multiplying the working load by 2X (or a multiple specified by the foundation engineer-of-record) to allow for a safety factor. Therefore the ultimate load is 30 kips X 2 = 60 kips.

In this example we will be using a solid square shaft. The required torque is calculated by dividing 60,000 lbs. by 10 (10:1 ratio) = 6,000 lbs. of torque.

In a torque test, the helical pier is installed with an arguer motor that contains a torque meter. The torque meter is monitored until a torque of 6,000 lbs. is achieved. At that point the length of the helical pier that has been installed underground (the depth) is measured.

Helical Pier Life Expectancy and Warranty

Q: Does Tella Firma provide a warranty?

A: Yes. Tella Firma provides a 10-year limited product warranty on all of its products including its lifting mechanism and its helical pier products. Tella Firma also provides a 10-year limited warranty on the helical pier installation if and only if the piers are installed by Tella Firma.

Q: What is covered in the Tella Firma Product warranties?

A: For a period of 10 years from the date of installation, Tella Firma warrants against failure of the foundation's structural integrity as a direct result of either a lifting mechanism failure or helical pier failure causing excessive deflection or tilt in the foundation. A Product failure is defined as a failure of the product to conform to the published Tella Firma specifications or a failure of the product due to material or manufacturing defects.

Q: What is covered in the Tella Firma helical pier installation warranty?

A: For a period of 10 years from the date of installation, Tella Firma warrants against failure of the foundation's structural integrity as a direct result of improper installation of the helical pier causing excessive movement in the helical pier resulting in excessive deflection or tilt in the foundation. This warranty applies ONLY if Tella Firma installs the helical piers.

Q: What is NOT covered in the Tella Firma warranty?

A: Tella Firma does not warrant the GeoTechnical report, the foundation design (in which the pier loading is specified) the installation of the lifting mechanism or the installation of the slab / quality of the concrete. The GeoTechnical Engineer and Engineering Design Firms are responsible for the soils report and pier loading specification, respectively, and the concrete contractor is responsible for the installation of the lifting mechanism, per product specification, and the slab installation.

Q: Does that mean that Tella Firma warrants against ANY movement in the foundation?

A: No. All foundations will have some level of acceptable movement in the form of deflection and/or tilt. Acceptable deflection and or tilt in most cases is unnoticeable and does not result in failure of the foundation's structural integrity.

Q: Who defines what is acceptable deflection and/or tilt in a foundation?

A: The Texas Section of American Society of Civil Engineers (ASCE) has published guidelines that are accepted and used by Texas Home Warranty companies. Tella Firma warranty is based upon these guidelines and therefore excessive deflection or tilt will be determined by following the Texas Section of American Society of Civil Engineers (ASCE) Guidelines for the Evaluation and Repair of Residential Foundations, Version 2, Adopted May 1, 2009.

Q: Does that mean that the expected life of a helical pier or lifting mechanism is 10 years?

A: No. The useful life expectancy of a helical pier or lifting mechanism is much longer than the warranty. The Tella Firma 10-year warranty is designed to align with the 10-year home warranty that builders offer their home buyers. The expected service of a Tella Firma helical pier should be greater than 75 years under normal soil conditions.

Q: Where are Tella Firma's helical piers manufactured?

A: Tella Firma helical piers are manufactured in the United States by our helical partner Hubbell Chance. Hubbell Chance is a leading provider of steel helical pile systems for foundations and foundation repair and is backed by over 100 years of engineering experience.

Q: What factors affect the life expectancy of the helical pier?

A: The life expectancy of a helical pier is a function of the characteristics of the soil (corrosive or non-corrosive), oxygen level of the soil, and load expectancy of the pier. Corrosion potential is higher in unsaturated soils. Unsaturated soils have both water and air filling the voids between the soil particles. The combination of water and air (oxygen) in the voids increases corrosion potential.

Excerpt from National Bureau of Standards Monograph 127 by Romanoff

"The data indicated that the type and amount of corrosion observed on the steel piling driven into undisturbed natural soil, regardless of the soil characteristics and properties, is not sufficient to significantly affect the strength or useful life of the piling as load-bearing structures. ... The data indicate that undisturbed soils are so deficient in oxygen at levels a few feet below ground line or below the water table zone, that steel pilings are not appreciably affected by corrosion, regardless of the soil types or the soil properties."

Q: Does a shallow water table effect the potential corrosion loss for a steel pile?

A: A shallow water table will not have much effect on the corrosion loss rate for steel piles. Underground corrosion typically occurs in unsaturated soils above the ground water table. As the water content increases, the air in the soil voids is displaced by the water up until the point that all the air is displaced and the soil is considerate 'saturated'. No air mean no oxygen – which reduces corrosion potential. Unsaturated soils are typically shallow (above the water table) while saturated soils by definition are below the water table.

Q: What is the working life expectancy of a Tella Firma helical pier?

A: At least 75 – 100 years based upon extensive life expectancy testing and analysis on its helical piers performed by Hubbell Chance. As an example, an analysis was performed by Hubbell Chance on the life expectancy of a helical pier to be used in Irving Texas. The results of this analysis predicts the estimated service life of a galvanized helical pier to be 193 years and 152 years for a non-galvanized helical pier. Applying a very conservative factor of 50%, the helical piers can be easily expected to last 75 – 100 years.

Q: Are Tella Firma's helical piers galvanized or non-galvanized?

A: Both. Tella Firma offers both galvanized and non-galvanized. However, non-galvanized helical piers are lower in cost. Given the exceptional life expectancy of a non-galvanized helical pier in non-corrosive soils, Tella Firma offers the non-galvanized as its "standard" product.

Miscellaneous Questions

Q: Can I install my own helical piers purchased from Tella Firma?

A: Yes. However we discourage installation of your own helicals unless the anticipated helical pier volume is very high. Prior to sale, installers must purchase the required installation and testing equipment and complete a training course and become certified.

Q: Who pays for the helical pier on-site “torque” test?

A: The customer must pay a \$500 helical pier test which is performed to gain a more accurate estimate of the helical pier depth required. The results of this test is used to generate a helical pier quote.

Q: Who cuts off the helical pier to the proper height?

A: It varies by situation. Typically the concrete contractor is responsible for cutting off the helical piers to the specified height. In some instances, Tella Firma will cut off the helical piers for a fee.

Q: Does Tella Firma pour the concrete helical pier cap?

A: No. Tella Firma is not a concrete contractor, therefore Tella Firma will work with the concrete contractor to learn the proper technique to install a concrete cap.

Q: Who specifies the helical pier size, shaft, and helix configuration?

A: Tella Firma will specify the helical pier size, shaft and helix configuration based upon the load specification provided by the foundation design engineer, the information in the Geotechnical soils test report and results of the helical pier site test.

Q: What is a geotechnical soils report?

A: A geotechnical or Geo-Tech Report is developed by a licensed geotechnical engineer. The report is based upon soil boring samples taken from the proposed building site. Once the technician completes the bore sampling, the samples are taken back to geotechnical laboratory and measurements are taken to determine a variety of soil characteristics including PVR (Potential Vertical Rise) and active soils zone. The geotechnical engineer then generates a Geo-Tech report, which provides valuable information to the foundation engineer including recommendation on soil remediation and potentially pier size and depth, based on the type of foundation and the PVR.

Q: Is the geotechnical report required if using helical piers instead of concrete piers?

A: Yes. Tella Firma requires geotechnical information on soil PVRs, active soil zone, and site specific anomalies in order to specify the proper helical pier and the slab lift height.

Q: Is the Tella Firma foundation system patented?

A: Yes. Tella Firma has 6 issued U.S. patents and 1 issued Canadian patent.

Q: How do I learn more about the Tella Firma Foundation System?

A: Go to www.tellafirma.com for any questions or any of our latest updates or contact us at info@tellafirma.com