DriveTech Helical Foundation SystemsDriveTech Helical Foundation Systems
248-666-4741 Ext 2
drivetechsystems.com
Waterford, Mi

Common types of soil and concerns related to Helical Foundations

A soil report is one way to determine the soil type a company will be working on, helping those in the industry better calculate the bearing capacity of the sand, as well as the depth and composition of other soils beneath the initial layer. In this article, we are going to briefly review some of the common soil types most soil testings identity.

Clay

Clay is an expansive soil made up of tiny particles. When wet, clay greatly expands, but when it is dry, it will shrink significantly. When clay is moist, it is very pliable and can easily be moved, manipulated, and shifted. These extreme changes can put a great deal of pressure on foundations, usually causing them to shift up and down or crack, which is why clay generally is not the best soil on which to construct a residential or commercial building.

Peat

Peaty soil is typically dark brown or black in color and is easily compressible because of how much water it can hold. This soil type is formed by decomposed organic material,is usually found near wetlands, and is extremely porous. Like clay, peat expands when wet, and in extremely dry conditions, it not only shrinks, but it also is a potential fire hazard. It is very poor subsoil when it comes to support, as foundations are most stable on soil that does not shift or change structure depending on weather conditions and that doesn’t have a low bearing capacity.

Silt

Silty soil is made of smaller particles, which is why it is able to retain water longer. However, because of its tendency to retain moisture, the soil is cold and drains poorly. This causes the silty soil to expand, putting pressure against the foundation and weakening it, making it not ideal for supporting a foundation.

Sand and Gravel

When compacted with gravel and other materials, sand does not retain water. Therefore, it will not cause any structures above it to shift. Sand and gravel have the largest particles of the various soil types, which is why it doesn’t retain moisture but drains easily. When soil and sand are compacted and moist, it holds together fairly well. Additionally, if the two are compacted, they make for good soil to support a foundation due to their non-water-retaining properties. However, when moist, the particles will lose their friction and can be washed away, which can leave gaps beneath the foundation and cause settlement issues down the road. Luckily, quality helical piers are an effective fix for foundations that are built on and supported by sand.

Rock

There are varieties of rock, such as limestone, bedrock, and sandstone — all of which have exceptionally high bearing capacities, making them a suitable soil type for supporting residential or commercial buildings. It's crucial that a rock surface is level before building a foundation, otherwise the foundation must be held into place with anchors.

Loam

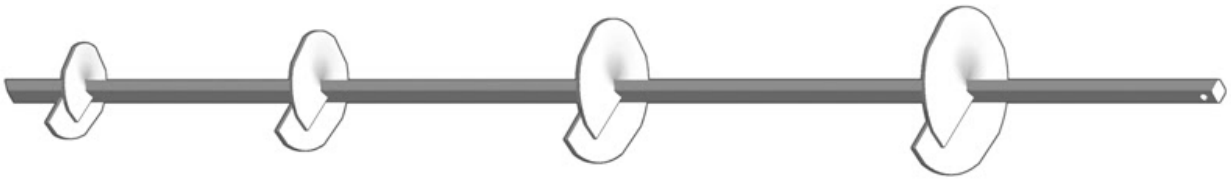
When it comes to the ideal soil type for foundations, loam may be the best option. Generally, loam is a combination of clay, silt, and sand. Loam is dark in color and soft, dry, and crumbly to the touch. Loam is great for supporting foundations due to its evenly balanced properties, especially how it handles moisture in a evened way and will generally not expand or shrink enough to cause damage. Loam is a good soil for supporting a foundation and building, as long as there are no miscellaneous soils that find their way onto the surface.

As you can see there are a variety of soil types, some creating more challenges than others when it comes to foundations. However, just because you are dealing with a soil type that doesn't offer the best support for foundations, doesn't mean it cannot be done.

This is why it is so important to have your soil tested by a qualified soil engineer that way you are able to have the correct Helical pile specified for the soil conditions of your site. When choosing which type of pile is to be used for Certain types of soil the engineer will pick from 4 major categories. In this brief guide, Outlined are the 4 major categories of helical pile designs, including their typical implementations, advantages and disadvantages of each.

SOLID SQUARE SHAFT

The square shaft is typically solid and capable of large axial compressive loads. The solid shaft is continuous at each extension and carries the load down through to the end of the pile. Square shaft extensions can also be used in a variety of tension applications.



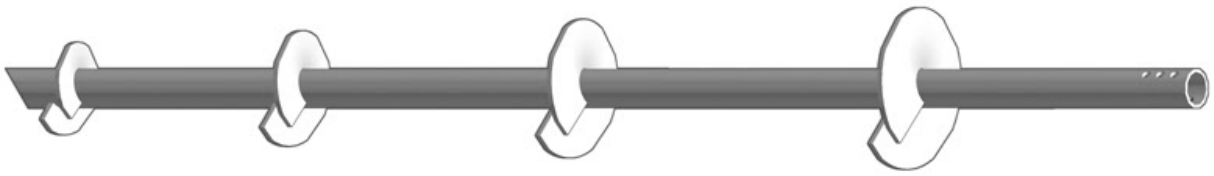
Typical Sizes: 1.5”, 1.75”, 2”, 2.25”

Advantages: In rocky and hard soils, square shaft leads are better at advancing without damage.

Disadvantages: Slender shafts do not resist lateral loads well and buckling can occur in soft soils due to the narrower width.

ROUND SHAFT PIPE

The round shaft pipe helical pile provides a much wider diameter than most square shaft piles. The wider cross section provides better structural capacity where large moments, lateral loading, or buckling can be present.



Typical Sizes: 2.875”, 3.5”, 4.5”, 6”, 8”, 10″+

Advantages: Round shaft piles are ideal for softer soils and when there is potential for high lateral loads. The pipe shafts can be grout filled for added structural capacity.

Disadvantages: Larger shafts can be more difficult to penetrate very dense or rocky soils.

SQUARE & ROUND SHAFT COMBO PILE

Typically a combo pile has a square shaft lead, followed by round shaft extensions. These types of helical piles are used primarily in compression applications where layers of hard soil are located deep under a softer surface soil. Square/round combo piles are often chosen for high water tables, grout restricted sites or for sites with soils that make them a more economic choice than a grouted pile configuration.

Typical Sizes: 1.5”/2.875”, 1.75”/3.5”, 2.25”/4.5″

Advantages: This combines the better penetrating characteristics of the square shaft with the large diameter round shaft extension to resist buckling and lateral loading.

Disadvantages: Extra material costs can make combo pile solutions a less economical solution than alternative helical piers. It is only necessary under specific circumstances.

GROUTED SQUARE SHAFT

All square shaft piles can be fitted with accessories to add a grouted casing. This casing is typically 5” to 8” in diameter and can be cased in PVC or steel pipe, or just grout. The grout also creates skin friction with the soil that can help the compression and tension capacity of the pile. The larger cross section improves lateral capacities, bending moment, and buckling resistance strength when compared to the slender square shaft pile on its own.

Advantages: In some soil conditions, square shafts with grout casing are more economical than larger diameter round shaft pipe piles.

Disadvantages: In some cases, grout plates can have difficulty advancing into very dense or rocky soils. Grout may also be prohibited from certain projects, for example in wetland applications or a site which cannot properly accommodate grout-mixing on site.

Choosing the right type of helical pile design needs to be done by an expert!

These basic explanations offer guidelines for which types of helical piles are appropriate for various projects, but there are many variables that go into making an educated decision.