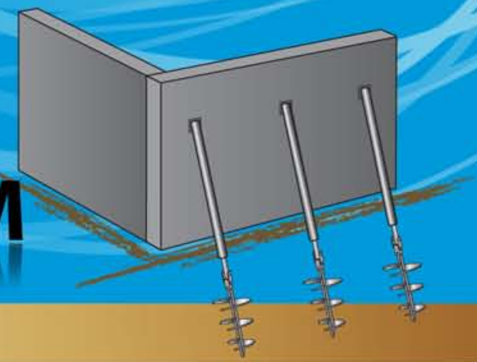
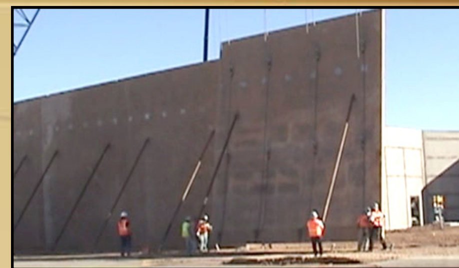
THE INSTA-BRACE SYSTEM



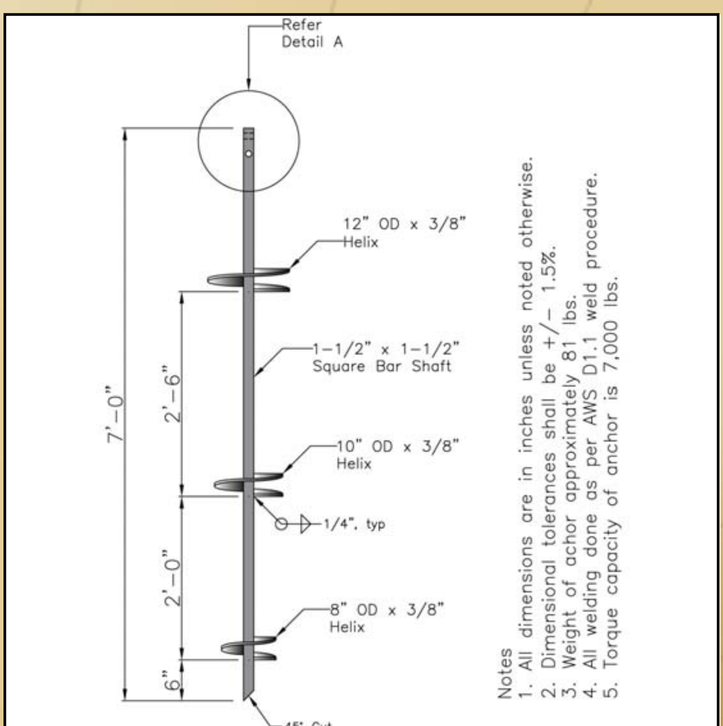


The newly developed Insta-Brace Anchor by PierTech Systems provides tilt-up contractors with an economical and efficient alternative to cast-in place, concrete dead-man.

INSTA-BRACE ANCHOR ADVANTAGES:

- Rapid Installation and Loading Capability
- Minimal Soil Disturbance
- Removable and Re-usable for future projects
- Verifiable Load Capacity Independent of Soil Conditions
- Matches or Exceeds Capacity of Our Strongest Braces in Most Applications
- Pre-Engineered System with Verified Load Capacity
- Bracing Can Be Place On The Inside or Outside of wall

PierTech Systems is revolutionizing the world of Tilt-up construction with the Insta-Brace Anchor.



PRODUCT SPECIFICATIONS:

The Insta-Brace Anchor by PierTech Systems has been pre-engineered for superior results in tilt-up applications. It consists of three helix plates welded to a 1 ½" square bar shaft. Each helix plate is specially formed from 3/8" x 44 ksi new steel plate. Our shaft steel has a typical yield strength of 95 ksi, and a typical tensile strength of 130 ksi, making it the strongest helical anchor available in the industry!

CAPACITY TO TORQUE RATIO:

The energy model for calculating helical anchor capacity/ torque relations is based on the claim that penetration energy is proportional to the volume of soil displaced multiplied by the distance displaced. Helical anchor installation characteristically involves screwing the anchor into the ground and applying a constant downward force. The energy that is required to rotate an object is equal to

225 Chesterfield Industrial Blvd. | Chesterfield, MO 63005 | Phone: 636.536.5007 | Fax: 636.536.5008 | www.piertech.com

the torque multiplied by the angle of rotation. Energy used by the downward force is merely the force multiplied by the distance over which the force acts. For one revolution, the volume of soil displaced by the helical pier is equivalent to the summation of the volumes of all the individual cutting blades plus the volume of soil displaced by the hub in moving downward the distance of the pitch as shown in figure 4.3. If the pitch is small, the volume of a helical plate is almost equal to the volume of a circular plate with the same radius. The distance necessary to displace the soil for helical blade insertion is roughly equal to half the thickness of the blades. For hub penetration, this distance is just about equal to the radius of the hub. Energy losses due to friction can be anticipated by converting soil shear stress into torque and multiplying by the angle of twist.

The acceptable movement of helical anchors is typically limited to minimal displacements. The capacity for small displacements can be figured by an energy balance between the energy used during loading and the appropriate penetration energy of each of the supporting blades. Energy losses because of friction along the hub are considered to be insignificant. This is because only a portion of the shear strength is mobilized for small displacements. In addition, the capacity in uplift is about equal to the bearing capacity, since minute movements in either the upward or downward direction should rely only on the effective confining stress around the blades. The energy throughout loading can be determined by integrating the applied force over a specific helical anchor displacement. The volume of soil displaced by the helical anchor is equal to the sum of the areas of the blades and the end area of the hub multiplied by the displacement distance. This presupposes that the end of the hub is closed or becomes blocked ruling out soil entry.

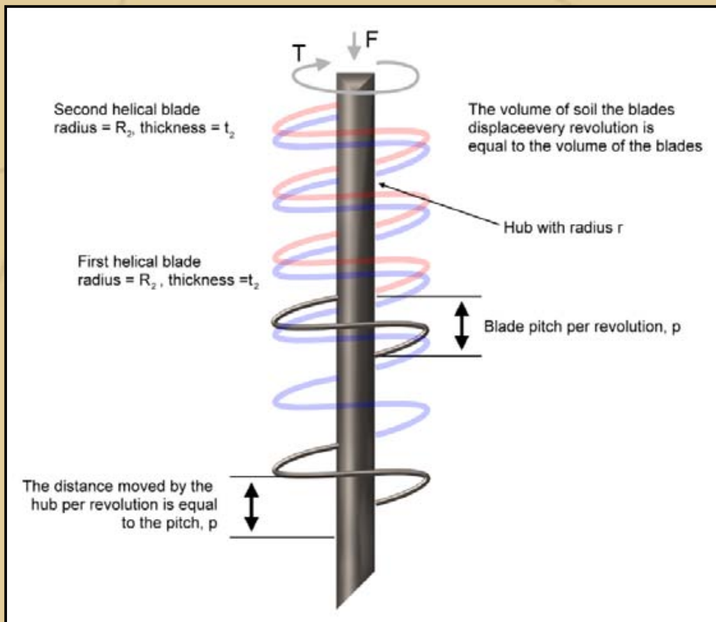


Figure 4.3 Helix Pier Installation Properties

The net product of these integrations and energy equivalencies is a relationship between installation torque and capacity given by:

$$Q = \frac{12d(2\pi T+Fp)[r2 + \sum m(Rm2-r2)]}{3[2r3p + \sum n(Rn2-r2)tn2] + 16\pi\alpha[3r3\lambda + \sum m(Rm3-r3)tm]} \qquad \text{Eqn. 4.6}$$

Where:
d = helical pile displacement
T = torque
F = downward pressure during installation
p = helice blade pitch
r = helical pile shaft diameter
m = total number of helice blades
n = number of helice blades cutting independent paths
Rm = radius of helice blade m
Rn = radius of helice cutting blade n
tm = thickness of helice blade m
tn = thickness of helice blade n
α = ratio of side shear to penetration resistance
λ = effective helical pile shaft length

It is recommended for helical pier displacement, d, to equal 1” (2.5cm) for helix pier design to be consistent with conventional foundation design thinking.

BEARING AND UPLIFT CAPACITY

Based on the “installation torque” method, helix anchor ultimate capacity is given by:

Qu = K T Eqn. 4.5

Where:
K = the capacity:torq
T = the final installation torqueThe K value is reliant on the geometry of the helix pier. For helical anchors with square shaft dimensions less than 2”, a value of 10 -1 is suggested by Hoyt and Clemence (1989). It is recommended that K values should be used for other helical anchor geometries.

A factor of safety of 3.0 is regularly used in bearing capacity calculations for footing and drilled caissons foundations. Although, in situations where the installation process includes an indirect measurement of soil strength at the foundation depth, lower factors of safety are acceptable. Pile driving is a commonly used example of this. The American Society of Civil Engineers Publication 20-96, “standard Guidelines for Design and Installation of Pile Foundations”, explains that a factor of safety of 1.5 is suitable for pile foundation. Given that the installation torque of helical anchors also supplies an indication of soil strength at the depth of the helices, a lower factor of safety is permitted for acceptable bearing and pullout capacity calculation. In general a factor of safety of 2 is used in helical anchor design.

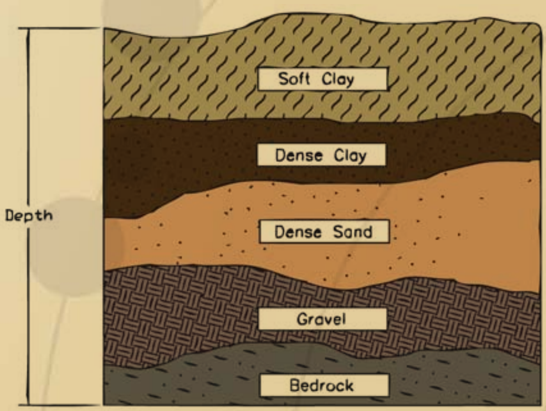


Figure 3.1: Soil Strata

SOIL MECHANICS

The maximum capacity of the Insta-Brace Anchor is the result of the strength of the surrounding soil because the loading force is transferred to the soil. There are typically two types of soils: cohesive and cohesionless. Cohesive soils are defined as soils whose internal angle of friction is approximately zero (Φ = 0) while cohesionless soils are those whose internal angle of friction is greater than zero (Φ > 0).

Cohesive and cohesionless soils have different reactions when exposed to stress. The particles of sand in cohesionless soils act independently of one another. This quality gives such soils many fluid-like characteristics. Cohesionless soils generally tend to compress when placed under stress. In contrast, cohesive soils have more rigid characteristics. Stiff clays tend to react more closely to rock, staying ridged and inflexible until failure. Soft clays have more pliable characteristics, bending and remolding under stress.

Soil naturally tends to develop in layers or strata, each with individual strengths and weaknesses. Figure 3.1 illustrates this stratification. As the Anchor is drilled into the ground, it will pass through different layers. Because each layer has different characteristics, different torque values will be observed as the anchor passes through each layer. During an ideal installation, the torque values will be constantly increasing, indicating the anchor is being inserted into more dense soil. If a drop in torque is recorded, it is most likely that a soft layer (such as soft clay) was found. The Anchor must then continue to be inserted past the soft layer until a more dense soil (i.e. higher torque) is found.

THE INSTA-BRACE SYSTEM

INSTALLATION:

A variety of rotary hydraulic equipment can be used to install the Insta-Brace Anchor including but not limited to: skidsteers, excavators, and boom mounted utility trucks.

The installer should maintain a continuous downward pressure on the Insta-Brace Anchor to avoid auguring during installation.

Throughout the installation of each Insta-Brace Anchor the torque will be continuously monitored and recorded. There is a direct relationship between installation torque and Anchor capacity. Continuous monitoring and recording of torque throughout installation gives a profile of the core soil conditions.

INSTALLATION REQUIREMENTS:

1) Installation is to be performed by a PierTech Systems trained and/or certified installer.
2) Using a hydraulic drive head, Insta-Brace Anchors are to be installed to a minimum torque of 2,400 ft-lbs. If minimum required torque is not achieved with a single anchor, additional 5'-0" extensions (Product #562669) shall be added until the torque requirement is achieved. It is recommended that preliminary boring logs at the site be obtained to help predict project requirements. In softer soils with Standard Penetration Test (SPT) blow counts (N) less than 10, an additional extension may be required. It is not recommended that the Anchor be installed in rocky soils with blow counts (N) greater than 30. Also, the presence of frozen soils may require pre-auguring so that the anchor can reach below the frost line.
3) Maximum allowable installation torque is 7,000 ft-lbs. Records of required installation torque for each Anchor are required.
4) Anchors to be installed in-line with the axis of the brace.
5) Welding, cutting, or any modification of the Insta-Brace Anchor or its components is strictly prohibited.
6) Brace attachment shall only use the Insta-Brace Anchor connector by PierTech Systems . To connect to brace, remove brace shoe and reuse 5/8" bolt for connector. Connector to Anchor requires one 3/4"Ø x 3 1/2" grade 5 bolt.

SAFETY NOTES:

1) The contractor shall locate all of the subsurface structures and utilities. Any subsurface structure or utility in the vicinity of the Anchor locations shall be clearly marked. Horizontal Clearance of anchor from any subsurface structure or utility shall be no less than 5'-0" at the depth of the utility. Installation of Anchors underneath utilities or subsurface structures is strictly prohibited.
2) Do not use damaged or worn Insta-Brace Anchors. Failure to inspect and replace damaged anchors may result in anchor failure.
3) The contractor is to undergo preventive measures to mitigate soil erosion adjacent to installed anchors.
4) Any changes resulting from actual installation conditions of the Anchor requires that the contractor contact PierTech Systems Engineering for further assistance to determine adequacy of anchor system.