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What is a 'helical pile'?

What is a helical screw pile foundation?

Terms such as helical screw pile foundation, screw piles, helical anchors, screw anchors and helical piers are often used interchangeably throughout the industry.

A Helical Screw Pile Foundation provides the same function as other foundations, i.e. to support loads transferred into the pile by any type of structure. This load can be tension, compression, or lateral.

A Helical Pile is simply a steel shaft with one or more helices (formed plates) welded to it. Installation of this type of pile can be compared to that of a self-tapping wood screw. Helical Piles are installed into the ground by the application of rotational torque, usually provided by a hydraulic powered auger system. The axial capacity of the pile is directly related to the torque achieved throughout the last 3-4 ft of installation (i.e. three times the diameter of the largest helix). This torque vs. capacity relationship for low displacement piles (i.e. ≤ 3.50 " shaft dia.) provides for an excellent on site quality control method. This is one of the major advantages of helical screw piles.

A Screw Pile includes three items:

1. **Shaft:**

Shaft sizes typically range from 1.25" sq. to 2.00"sq. high strength steel bar and up to 10.75" diameter steel pipe. Expected loads that will result from installation and application normally govern the required size and shape of the shaft. Other factors, such as the method of connecting the pile to the structure, may also influence the required shaft size and shape.

The shaft has at least four functions-

- A. To provide the required torsional capacity for proper installation
- B. To sustain loads transferred from the helices-during and after installation
- C. To sustain loads transferred from the structure –after installation
- D. To provide the proper connection (interface) to the structure

2. **Helices**

Helical Screw Piles usually include one to six helices. In the case of multi-helical lead sections, the smaller diameter helix always enters the ground first-followed by larger diameter helices or helices of the same size. The difference between diameters of adjacent helices should not exceed 2". The distance between any two helices should be at least three times the diameter of the smaller (or lower) helix. To minimize soil disturbance, helices must be formed to a true helical shape with uniform pitch by matching metal dies.



Helices have at least four functions-

- A. To pull the pile into the soil to the required depth-during installation
- B. To transfer load into the soil by means of exerting bearing pressure-after installation
- C. To provide the required torsional and bearing capacity-during and after installation
- D. To provide the required strength (welded connection) between the helix and shaft

3. Pile/Structure Interface Connection:

Methods of connecting the pile to the structure depend on the type of structure to be supported. Connections can range from complex welded brackets to holes drilled into the top of the pile. The major consideration for this connection is to assure that there is a clean transfer of load from the structure to the pile.

ADVANTAGES AND BENEFITS

Construction:

- The installation equipment for screw pile foundations is generally smaller, lighter and less specialized than that required for other types of foundations such as drilled piers, driven piles and auger cast piles. The cost of mobilizing equipment (move in - move out) is generally much less with helical crew piles than with other types of foundation systems.
- In addition to significant cost savings, the smaller (less specialized) installation equipment, used with helical screw piles, allowed for quick responses to situations requiring immediate action.
- The relatively small size of the installation equipment allows for PTS piles to be installed in confined areas (such as inside buildings or areas with low head room clearance) where other conventional means of foundations would be neither feasible nor practical. In some cases the installation equipment can be hand held.
- The installation of screw pile foundations is virtually vibration free, thus allowing installation near existing foundations or footings.
- Onsite Quality Control: By applying the torque vs. capacity relationship, the ultimate capacity of the pile can be determined at the time of its installation.
- The installation of screw pile foundations does not create spoils. This eliminates the time cost associated with spoil removal and disposal.



Environmental:

- Installation is virtually vibration free
- Noise level is relatively low.
- Due to the low vibration and noise level, Premium Technical Services piles can be installed in close proximity to existing structures and populated areas.
- The relatively light (low ground pressure) equipment minimizes surface damage to the area. In some cases the installation equipment can be hand held.

Seismic Loads-New Construction and Seismic Retrofit

- During seismic events, the flexibility of the steel shafts used with Premium Technical Services helical pier foundations will better accommodate movement than conventional shallow foundation systems. The advantages of helical pier foundations to resist seismic loads are now recognized in southern California and other areas prone to seismic activity.