

Recommended Installation Procedures

DriveRite Series 25000, 26000, 35000 and 36000 Helical Piles

DriveRite Series 25000, 26000, 35000 and 36000 helical piles are tubular shaft, single- or multi-helix piles normally installed with either hand-held or machine-mounted hydraulic gearmotors.

It is imperative that all site safety issues be identified and communicated to the entire installation crew before beginning installation operations. **Helical piles will penetrate underground gas pipelines and electrical cables, as well as other underground utilities, possibly exposing workers to extreme hazards.** State laws require all "excavators", including installers of helical piles, to have underground utilities marked before digging. Law assigns this responsibility to the person who will do the actual digging; it cannot be delegated to anyone else.

Helical piles and the equipment used to install them are electrically conductive and must not be allowed to contact either underground or overhead power lines. Especially when operating machine-mounted equipment in the vicinity of overhead power lines, ground crewmen must stay clear of the equipment and any attached pile whenever the equipment or its boom is being moved.

All installation crewmembers must wear all OSHA-required personal safety equipment, including at the minimum hard hats, safety glasses, gloves and safety shoes/boots.

The forces developed between parts of the drive train and between the gearmotor and its restraints can be deceptively high. Installation crewmembers should be limited to only properly trained personnel. When using hand-held installation equipment, the torque-restraint bar must be securely anchored to a rigid support in such a fashion that it will not come loose if the equipment jumps or lurches, as may happen when a pile hits an underground obstruction. **The equipment must not under any circumstances be operated with personnel holding, standing on, or otherwise attempting to personally restrain the torque bar.** Personnel should stay clear of at least the first half-circle of the area that would be swept by the torque bar should it come loose from its restraint. Personnel should stay clear of equipment outriggers during pile installation operations. The equipment typically rises and falls as the installation progresses, thus posing a threat particularly to feet.

Installation tooling consists of a Kelly bar or gearmotor output shaft adapter and a pile drive adapter, connected together with bolts. It may also include an in-line torque indicator or torque limiter connected between the Kelly bar adapter and the drive adapter. Use only tooling having a torque rating above the pile's torque rating. The connecting bolts are subject to loosening from wobbling and vibration during pile installation operations; they must be checked frequently and tightened as necessary. **Loose bolts will shear below the tooling's torque rating, possibly propelling the debris at high speed and endangering personnel within a wide area. Tighten bolts frequently.**

Helical piles may be installed at any angle, so long as alignment is maintained between the gearmotor output shaft and the pile shaft. Failure to maintain alignment between the gearmotor output shaft and the pile shaft may result in damage to the gearmotor bearings and/or the pile shaft, and may void the gearmotor warranty.

Installing the Pile

Pin the pile lead section into the drive adapter. **Keep hands away from pinch points anywhere parts may move relative to one another, particularly where the pile end enters the drive adapter.** Be sure to lock the cross pins or bolts securely. Do not use cotter pins or over-toggle devices. Vibrations during installation will loosen nuts, eject cotter pins and over-toggle devices and generally defeat most methods of retaining cross pins or bolts. **Pile shafts may spin backward when the gearmotor is de-energized abruptly from high torque, possibly ejecting unsecured locking devices and cross pins at high speed and endangering personnel within a wide area.** Cross-drilled pins and double-coil lock rings (similar to key rings) are recommended.

Move the pile to its intended installation location. Piles to be installed in generally vertical orientation may be started vertically and then adjusted to the correct angle after the first helix enters the ground and stabilizes the pile (but before the second helix, if any, enters the ground). Piles to be installed near horizontal, such as tiebacks and soil nails, should be started close to the intended alignment, and can then be adjusted after the first helix (but before the second helix) enters the ground.

Begin installation by applying down pressure ("crowd") and right-hand twisting action, as with a right-hand threaded screw. Maintain just enough crowd to keep the pile advancing at 2-1/2 to 3 inches per revolution. The amount of crowd required will change from time to time during installation as the pile encounters different sub-surface conditions. Too much crowd will result in the pile advancing more than 3 inches per revolution, and too little crowd will cause it to advance less than 2-1/2 inches per revolution. Both must be avoided at the end of installation, as they will result in excessive soil disturbance and reduced load resistance. They may also hinder penetration of hard strata by disturbing the soil the helices must push against to overcome the increased resistance at the pile toe.

When the pile head gets to within about a foot of the surface, stop the installation and disengage the pile drive adapter from the pile. This will require the drive adapter be closely aligned with the pile axis as well as release of any axial force between them, which can be a challenge with non-vertical pile installations. If you are unable to get good alignment, you may have to drive the cross-bolts or pins out with a hammer. **Avoid pinch points during this operation and keep personnel clear of the area, as the gearmotor may "pop loose" and swing free when the pins are freed.**

Extensions may be added to the existing pile first, or pinned into the drive adapter first and then to the existing pile. The most efficient way depends on the length of the extension, the angle of installation and the installing equipment being used. **Avoid pinch points. Be sure to tighten the coupling bolts and securely lock the cross pins at the drive adapter.**

Helical pile specifications will typically give both minimum embedment depth (the minimum distance from the ground surface to the first helix, measured along the pile shaft) and minimum effective torsional resistance installation termination criteria. Generally, the pile must be driven until both criteria are met. However, you must be sure not to exceed the pile's or installation tooling's torque rating. In the event you are unable to reach one or both of the termination criteria, prequalified adjustments may be available. Consult the specifications. If no prequalified adjustments are defined, consult the project's engineer. For projects with no specifications and not under the supervision of an engineer, consult the model specifications contained in the DriveRite Engineering Manual.

Effective torsional resistance can be used to infer the ultimate bearing capacity of the installed pile. It is determined from the type of service loading and the torsional resistance encountered during installation. For axial tension loading, the effective torsional resistance is the average torsional resistance encountered as the largest helix moves from a position three times its own diameter "above" its final position to its final position (see figure at right). For axial compression, the effective torsional resistance is the final torsional resistance, provided the resistance does not decrease significantly while the largest helix moves from a position three times its own diameter "above" its final position to its final position.

DriveRite recommends its piles be installed so that all helices are located below the level of seasonal and long-term change in soil properties so that their capacity will be stable over time. Piles used in tension should be installed so that the last (top-most) helix is at least 5 times its own diameter below the ground surface, measured vertically. Adjacent piles should be spaced at least three times the diameter of the largest helix apart laterally. "Vertical" piles may be angled apart slightly to achieve the three diameter spacing at the helices while still meeting closer spacing requirements at the surface.

