

# Retrofit Helical Piers vs Hydraulically-Driven Push Piers

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Both retrofit helical piers and hydraulically-driven push piers can be used to stabilize settled structures or support additional loads transferred to existing foundations. But are there conditions where one system may be a better fit over the other?

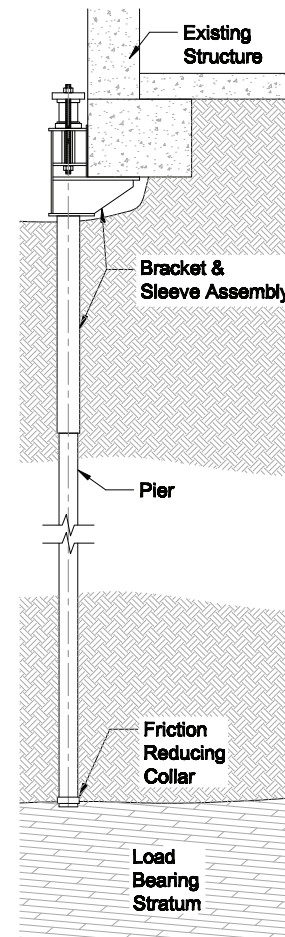
Let's start with a brief overview of the systems. Both utilize side load retrofit brackets positioned against and below the existing footings. With push piers, the bracket is first set against the footing, relatively small driving equipment is assembled at each location, and the pier sections are "pushed" through the bracket with a hydraulic cylinder to a suitable load bearing stratum. Push piers utilize the weight of the structure and the surrounding soil load as the reaction to drive the piers. Helical piers are rotated/screwed into the ground by the application of torque. Torque is provided by a drive head typically mounted to hand-held equipment or smaller machines (mini-excavators, skid steers, etc.). Helical pier advancement is independent of the structure and the retrofit bracket is set in place after the pier is installed.

FSI utilizes an external sleeve through the foundation brackets for most push and helical pier assemblies to resist the bending forces generated by the eccentric loading condition. The push pier external sleeve is typically 48 inches long as opposed to 30 inches for most retrofit helical piers. With the external sleeve resisting most of the bending, push pier sections are subjected to mainly axial loads during installation and while in service, and can therefore consist of thinner shaft material. Helical piers must resist torsional forces during installation, which generally requires a thicker pier shaft than would be required to simply resist axial loads.

Let's now review some of the factors that may be considered in the decision of selecting one system over the other.

- 1. Cost.** Push piers are made with thinner pier sections than their helical counterparts and push pier couplers are simple slip-fit connections versus the helical pier external welded or detached couplers with nuts and bolts. Therefore, if both systems were advanced to similar depths, the push pier would be more economical.
- 2. Soil Conditions.** Typically, standard penetration test (ASTM D1586) blow counts, N-values, of 35-40 blows per foot (bpf) for clay and 30-35 bpf for sand are required to

Push Pier Installation



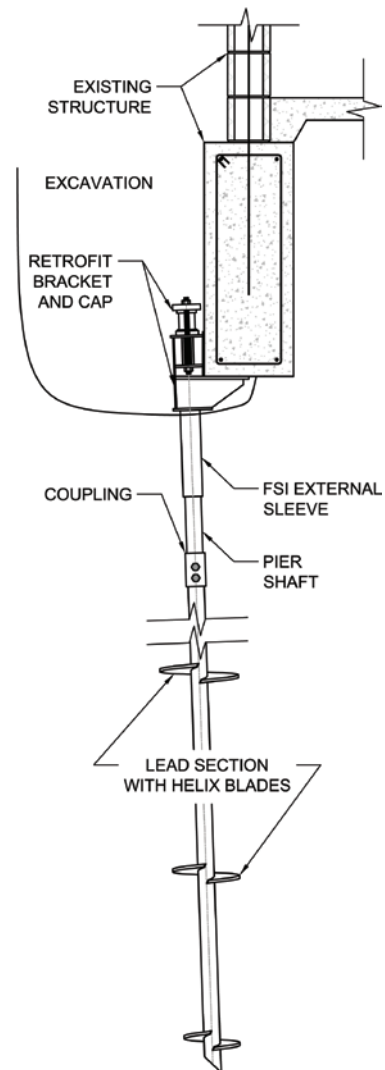
provide end-bearing resistance for push piers. N-values of at least 15 bpf for clay and 10 bpf for sand are preferred for providing the end-bearing resistance for helical piers. Helical piers may then be considered the more versatile option for many soil profiles. Lead sections and extensions can be configured to develop capacity in a broader range of soil conditions.

- 3. Limited Soil Information.** Push piers are simply driven until competent soil is encountered. Push piers are driven to a target "ultimate" force and this force may be held for some pre-determined time to monitor for creep. Therefore, each push pier installation could be considered "load

tested.” For helical piers, a general knowledge of soil conditions is required to adequately determine the helix plate bearing area to support the design loads. You must also consider that a helical pier is more likely to develop its target (torsional) resistance within seemingly competent soil, like engineered fill, above deeper compressible layers. In such cases, retrofit piers provide no benefit and the structure would continue to settle.

4. **Light Structures.** Light structures with shallow footings (minimal soil load) may not be good candidates for push piers. The building may start to mobilize/lift before the target ultimate force is applied. When a minimum practical force, determined on a case by case basis, cannot be reached, an acceptable factor of safety will likely not be achieved. Retrofit helical piers may therefore be the better option.
5. **Limited Access/Ease of Installation.** Push piers utilize smaller installation equipment and are ideal for interior work and limited access areas. Helical piers can be installed in tight access areas with hand-held equipment, but still with greater difficulty than push piers. Increasing the number of helix plates along the helical pier shaft also increases installation difficulty.
6. **Preference.** Even with all other factors considered, the engineer of record or the installing contractor may simply prefer one system over the other. Contractor preference is often reflected in comparative pricing.

There are certainly other factors that may be considered in the selection of push piers or helical piers, and many projects offer their own unique challenges. Contact FSI or an FSI installing contractor if you have questions about your next retrofit piercing project.



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Jeff is involved in product design, product verification testing, preliminary design applications, project consulting, conducting installation, sales and marketing training, as well as developing and presenting education-based material. Jeff routinely travels throughout the United States and Canada to consult with local installing contractors about general or project-specific needs, and to present technical information to engineers, architects and general contractors.