2.11 Concentric Push Pier Installation

The concentric push pier system is used to stabilize and lift settled foundations. Unlike the typical "side-load" retrofit brackets, these systems are installed directly beneath foundation walls or point loads and, therefore, are not exposed to bending forces generated from off-set, eccentric loading conditions (*Figure 2.47*). Concentric piers are commonly used in confined spaces such as crawl spaces or tunnels, on pier-and-beam foundations, on post-tensioned slab interior grade beams, and under shallow exterior wall footings with limited soil cover.

Figure 2.47 Concentric pier installation

Step 1: Excavation

1. Excavate a 3-foot square hole to an approximate depth of 40 inches below the bottom of footing.

2. Excavate the soil from beneath the footing back an adequate horizontal distance so that the drive stand assembly can be located directly below the center of the foundation wall.

3. Remove all soil that may be adhered to the bottom of the footing.

4. Bottom of excavation and footing should be flat. Use chipping hammer as necessary (*Figure 2.48*).

Figure 2.48 Prepare bottom of footing with chipping hammer, as necessary, to create a flat and level surface

Step 2: Drive Stand & Hydraulic Drive Cylinder Placement

1. Place collapsed drive stand under the footing and center below the foundation wall above.
2. Level and plumb the drive stand.
3. Remove hitch pins from the telescoping legs.
4. Raise the top of the drive stand to as close to the bottom of footing as possible.
5. Insert hitch pins into the upper holes on the drive stand legs. If installing a grout plate, place plate with grout on top of drive stand (*Figure 2.49*).
6. Place a starter tube section on top of the floating middle plate.
7. Raise the floating middle plate until the top plate on the drive stand is approximately two inches below the bottom of the footing *(Figure 2.50)*.
8. Tighten the coil nuts on both sides of the drive stand.
9. Remove starter tube from the middle plate.
10. Place hydraulic drive cylinder on the middle plate *(Figure 2.51)*.
11. Place starter section and small drive tube through the hole in the drive stand bottom plate.
12. Connect hydraulic pump to the cylinder.
13. Slowly extend cylinder until the top of the drive stand engages the bottom of footing *(Figure 2.52)*.
14. Tighten the coil nuts on both sides of the drive stand.

Figure 2.49 Grout plate used to create uniform bearing

Figure 2.50 Drive stand setup within excavation

Figure 2.51 Placement of hydraulic drive cylinder

Figure 2.52 Extend hydraulic cylinder to engage footing

Step 3: Pier Tube Installation

1. Make sure starter section is plumb and adjust drive stand as necessary *(Figure 2.53)*.
2. Fully extend cylinder.
3. Fully retract cylinder.
4. Remove small drive tube.
5. Place medium drive tube onto starter tube.
6. Fully extend cylinder.
7. Fully retract cylinder.
8. Remove medium drive tube.
9. Place large drive tube onto starter tube.
10. Fully extend cylinder.
11. Record final drive pressure for that section.
12. Fully retract cylinder.
13. Remove large drive tube.
14. Place an 18-inch long push pier tube into the starter section.
15. Repeat procedure for rest of the tube sections. Pier advancement is terminated when the target drive pressure is achieved, or the structure starts to mobilize.
16. Occasionally check that the coil nuts are tight and that the drive stand and pier sections are plumb.

Figure 2.53 Check alignment of drive stand and starter section

Step 4: Drive Stand & Hydraulic Drive Cylinder Removal

1. Extend cylinder and loosen coil nuts several inches.
2. Fully retract cylinder and remove from drive stand.
3. Remove hitch pins and lower drive stand to the collapsed position.
4. Place hitch pins into the lower holes on the drive stand legs.
5. Remove drive stand assembly from excavation.

Step 5: Pier Bracket & Hydraulic Lift Cylinder Placement

1. Measure the distance from the bottom of the footing to the top of the last pier tube *(Figure 2.54)*.
2. Subtract 15 inches from the measured dimension and cut a 36-inch long pier tube to this lenght.
3. Connect the pier cap to the bracket with coil rods and nuts.
4. Insert the cut pier tube through the bottom plate of the bracket and up against the pier cap.
5. Secure the pier tube to the bracket with the Concentric Pier Vice Grip *(Figure 2.55)*.
6. Place bracket assembly onto the last driven pier tube *(Figure 2.56)*.
7. Remove the vice grip.
8. Lift bracket to the bottom of the footing.
9. Tighten the coil nuts.
10. Place hydraulic cylinder on top of the pier cap.
11. Slowly extend the cylinder until the top of the bracket is snug against the bottom of footing *(Figure 2.57)*.
12. Make sure the bracket is plumb and adjust as necessary.
13. Tighten coil rod nuts.

Figure 2.54 Measure from bottom of footing to top of installed pier section

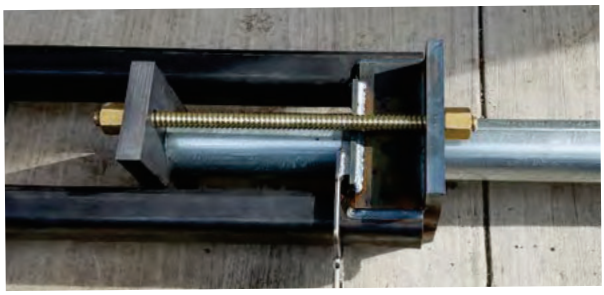

Figure 2.55 Assemble bracket and pier section outside of excavation

Figure 2.56 Place bracket assembly onto last driven pier tube

Figure 2.57 Place hydraulic cylinder and snug bracket against footing

Step 6: Structural Lift and/or Lock Off

Refer to *Section 2.9*, Step 6, for final procedures.

Step 7: Backfill & Clean Up

Completely backfill all excavations and properly compact soil with a mechanical tamper.

Figure 2.58 Completed concentric pier installation

2.11.1 Push Pier SmartJack System

The drive equipment used to install concentric piers can also be used to install push piers that provide a deep foundation for a SmartJack system beneath a main girder. The Foundation Supportworks SmartJack system provides supplemental support to structures within a crawl space and is described in detail in Chapter 4. The push piers will transfer the load from the girders through weak upper soils and into competent load bearing strata below *(Figure 2.59)*. Refer to the technical specifications within *Appendix 2* (for concentric piers) and *Appendix 4* (for SmartJacks) for component and system capacities.

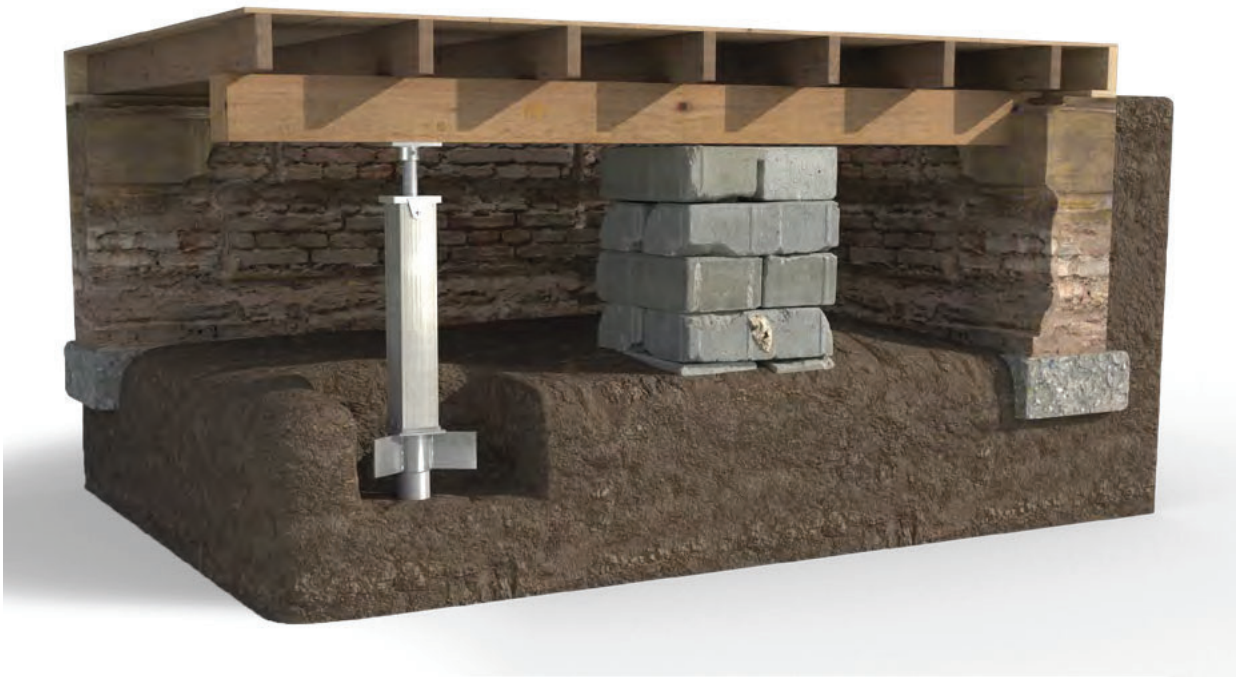

Figure 2.59 Graphic of a Push Pier SmartJack installation. Backfill around base of SmartJack not shown for clarity. Backfill is required.

Step 1: Excavation

1. Excavate an approximate 2-foot square hole to a distance of 40 inches below the bottom of the girder.

2. Bottom of excavation should be flat and level.

Step 2: Pier Installation

Much slower installation should be used to install push piers supporting SmartJacks to reduce the risk of overstressing the supported structure above during the pier driving operations.

See Steps 2, 3, and 4 within the Concentric Push Pier Installation *(Figure 2.60)*. The top of the last installed pier tube should be below the ground surface elevation, i.e., below the top of the excavation. Cut tube as necessary.

Figure 2.60 Concentric pier drive stand beneath main girder in crawl space

Step 3: SmartJack Base Plate

1. Place the Push Pier SmartJack Base Plate onto the last installed pier tube *(Figure 2.61)*.

Figure 2.61

2. Backfill and compact thoroughly to the top of the base plate *(Figure 2.62)*. If the existing soil is excessively wet or dry, or consists of a material type that cannot be reasonably compacted, consideration should be given to bringing in adequate backfill soil, mixing the existing soil with a cement bag mix to improve strength, or backfilling the excavation with concrete.

Figure 2.62

3. Complete Steps 3 through 5 from *Section 4.2*

Step 4: Backfill & Cleanup

Backfill and compact soil to fil the remainder of the excavation. Level out extra spoils, replace concrete, or install a crawl space liner as required.

Figure 2.63 Completed Push Pier SmartJack installation. Model 288 SmartJack shown.