2.12 PP288 Slab Push Pier Installation

The PP288 slab pier system is used to stabilize and/or lift settled concrete floor slabs. Monometer survey equipment, a laser level, a zip level, or other suitable equipment should be used to identify low areas in the slab. Slab piers should be located at these identified low points. Slab piers should also be considered in areas of significant floor cracking, either centered on the crack or located on alternating sides of the crack to ensure an even lift. Voids beneath a stabilized and lifted slab should be filled with suitable material such as a cementitious grout mixture or PolyLevel® polyurethane foam.

Step 1: Slab Preparation

1. Mark the slab pier locations with consideration given to possible underground utilities, overhead obstructions, maximum pier spacing, existing floor cracks and lift requirements.

   Slab pier spacing can be estimated using *Figure 2.64*, which gives a recommended grid pattern spacing for various slab thickness and live load combinations. The guide is based on unreinforced concrete slabs having a minimum concrete strength of 2,500 psi.

		Live Load				
		30 psf	40 psf	50 psf	60 psf	80 psf
Slab Thickness	3.5"	5'-0"	4'-6" (Typical for Residential)	4'-3"	4'-0"	3'-9"
	4.0"	5'-6"	5'-0" (Typical for Residential)	4'-9"	4'-6"	4'-3"
	4.5"	6'-0"	5'-6" (Typical for Residential)	5'-3"	5'-0"	4'-6"
	5.0"	6'-6"	6'-0"	5'-9"	5'-6"	5'-0"
	6.0"	7'-3"	7'-0"	6'-6"	6'-3"	5'-9"
	8.0"	8'-9"	8'-6"	8'-3"	7'-9"	7'-3"

Figure 2.64 Slab Pier Spacing Guide

2. Core 8-inch diameter holes in the concrete slab (*Figure 2.65*). Adjust slab pier locations and spacings based on the actual concrete thickness determined at the first cored hole. Remove the concrete cores and use a hand probe to check for underground obstructions (*Figure 2.66*). Using a small hand tool, excavate all material beneath the slab to at least 4 inches below the bottom of the slab and extending at least 3 inches beyond the edges of the cored hole (*Figure 2.67*). Check with your hand to confirm that the bottom of slab is relatively smooth and free of subgrade material.

Safety precautions must be followed during concrete coring to ensure the core drill is securely mounted to the floor slab and proper safety equipment including eye and ear protection is worn during coring operations. Immediately remove any water from the floor when coring to reduce potential for electrical shock. Keep body parts, clothing and other objects away from core bit during operation.

Figure 2.65 Concrete coring

Figure 2.66 Probing for utilities or obstructions

Figure 2.67 Excavating beneath the slab

Step 2: Assembling the Bracket Below the Slab

1. The PP288 slab pier bracket assembly consists of one (1) main plate, two (2) wing plates, two (2) 14-inch long ⅝-inch diameter threaded rods, four (4) ⅝-inch hex nuts, and one (1) pier cap. Set the main plate (first) and the wing plates (second) through the cored hole. Cover the welded nuts on the bottom of the main plate with duct tape prior to placement through the cored hole to ensure clean threads for later insertion of the threaded rods. Locate the wing plates above the main plate so that the wing plate holes line up with the holes in the main plate (*Figure 2.68*). Align the straight edges of the two wing plates to be essentially parallel with each other.

Figure 2.68 Main plate and wing plates positioned and aligned beneath the slab

2. Install hex nuts on one end of the threaded rods leaving about 2½ inches of thread below the nuts. Insert the threaded rods through the wing plate holes and thread them into the weld nuts below the main plate. Turn the rods by hand until the nuts on the threaded rods are seated against the top surface of the wing plates. Continue to tighten the nuts with a deep well socket to fasten the wing plates firmly to the main plate (*Figure 2.69*).

Figure 2.69 Threaded rods installed

Step 3: Mounting the Drive Stand & Drive Cylinder

1. Cut the coupler extension off a standard 36-inch long pier tube to use as your starter tube (*Figure 2.70*). Insert the "coupler" end of the starter tube through the hole of the main plate.

2. Place the slab pier drive adaptor over the pier tube and allow the ⅝-inch threaded rods from the bracket to extend through the holes within the drive adaptor (*Figure 2.71*). The pier tube assists with alignment of the bracket main plate with the slab pier drive adaptor. Alternatively, the pier tube could also be placed through the bracket after positioning of the drive adaptor, but before the threaded rods are tightened.

Figure 2.70 Starter tube made by cutting coupler end of standard pier tube

Figure 2.71 Slab pier drive adaptor installed

3. Pull up on the threaded rods while tightening the hex nuts to bring the bracket wing plates snug against the bottom of the slab. Slide the PP288 drive stand onto the slab pier drive adaptor and secure with L-pins (*Figure 2.72*). Set the hydraulic drive cylinder into the top fixture of the drive stand and lock it in position with the coil rod and nuts (*Figure 2.73*). Connect the hydraulic hoses.

Figure 2.72 PP288 drive stand mounted to slab pier drive adaptor

Figure 2.73 Drive cylinder set into top fixture of drive stand

Step 4: Pier Tube Installation

1. Much slower installation speeds should be used to install slab piers to reduce the risk of overstressing the concrete slab during pier driving operations.

2. Pier tubes are driven using similar procedures as outlined in *Section 2.9* (Step 4), including recording of drive pressures at the end of each driven tube section. The drive stand should self-align when force is applied by the drive cylinder to the pier tubes; therefore, no cribbing or alignment of the drive stand should be necessary if the floor slab was prepared properly.

   Safety precautions must be followed when driving pier tube sections to ensure that body and clothing are away from pinch points. Take caution and avoid over-stroking the cylinder rod which may result in a rapid increase in pressure, possibly resulting in cylinder damage or personal injury.

3. Drive pier tubes until the required termination drive force is achieved or slab movement (flexing) in excess of about ¼ inch occurs. Care should be taken by the installer to slowly release hydraulic pressure at the end of each cylinder stroke. Once the predetermined termination drive force is achieved or the slab starts to lift, the pressure is released from the hydraulic system and the drive stand and drive cylinder are removed from the slab pier drive adaptor. The drive adaptor is then disconnected from the threaded rods of the slab pier bracket.

Step 5: Mounting the Lift Cylinder

1. The last pier tube section is pulled from the hole, cut to desired length in a chop saw and replaced. The desired top-of-pier elevation relative to the top of the slab depends upon the slab thickness and the maximum amount of lift anticipated. If the slab will be stabilized without lifting, the top of pier tube can be approximately two inches below the top of the floor slab. It is imperative that the pier tube is cut correctly to ensure that the pier cap, threaded rod, and nuts are below the top of the slab after lift and/or lock-off operations.

2. Place the pier cap over the threaded rods and lightly tighten it against the top of the pier tube with two ⅝-inch hex nuts (*Figure 2.74* and *Figure 2.75*). Set the lift cylinder assembly onto the pier cap (*Figure 2.76*). Couple the threaded rods of the lift cylinder plate assembly to the threaded rods of the slab bracket to hold the lift cylinder in place (*Figure 2.77*).

   Note: The ¾-inch threaded rods of the standard Model 288 lift cylinder assembly are larger than the ⅝-inch rods of the slab pier bracket and are not used in this application.

Figure 2.74 Pier tube cut to length; pier cap placed

Figure 2.76 Lift cylinder assembly set on pier cap

Figure 2.75 Lightly tighten pier cap down onto pier tube

Figure 2.77 Lift plate assembly coupled to threaded rods of slab pier bracket

Step 6: Slab Lift and/or Lock off

1. Connect hydraulic hoses to the top and bottom fittings on the lift cylinders (*Figure 2.78*). The lift cylinders are all hydraulically connected as a system (*Figure 2.79*) in order to provide simultaneous lift pressure at each cylinder. The system is first equalized by opening the valves at each cylinder in sequence and adjusting the system pressure. The system should be equalized to pressures on the order of 100 to 300 psi.

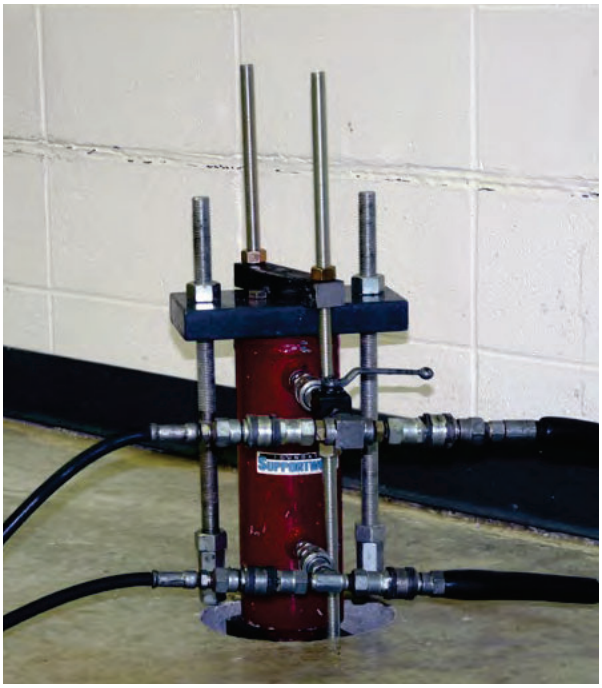

Figure 2.78 Hydraulic connections at lift cylinder

Figure 2.79 Lift cylinders connected for simultaneous loading

2. Slowly raise the pump pressure to raise the slab. Monitor the slab for lift at each pier location. After achieving the desired lift, close the valve to the top of the cylinder. If the piers are for stabilization only, close the valves as soon as noticeable slab movement occurs. Once all the cylinder valves are closed, the piers are locked off by tightening the ⅝-inch hex nuts to the tops of the pier caps (*Figure 2.80*).

Figure 2.80 Pier load locked off by tightening nuts on top of pier cap

3. The system pressure is released and the lift cylinder assemblies are removed. Cut the threaded rods flush with the tops of the hex nuts with a grinder or saw (*Figure 2.81*). The tops of the nuts must be below the surface elevation of the slab.

Figure 2.81 Cutting the threaded rods

Step 7: Void Fill & Finish Surface

Place concrete and trowel finish at each pier location (*Figure 2.82* and *Figure 2.83*). Voids under the slab should be filled completely with a suitable grout mixture or PolyLevel® polyurethane foam. Void filling is typically completed before patching the core holes with concrete, but can be done either before or after the concrete is placed. Concrete patches should be allowed to cure before void filling.

Figure 2.82 Patching holes at pier locations

Figure 2.83 Finishing concrete

2.13 Push Pier Load Testing

The push pier installation process is essentially equivalent to performing a proof load test at each push pier location; therefore, "official" load testing of push pier systems is not commonly required. The piers are advanced to a final drive pressure or ultimate load, then reloaded to the specified lock-off load (typically at or near the service load) or until the desired lift is achieved. The drive and lock-off loads are easily calculated from the effective area of the hydraulic cylinder and the pressure gauge reading at the hydraulic pump.

If it is determined that a proof test is necessary, then the production pier can be loaded incrementally with deflections measured using the procedure outlined in Evaluation Report ER-289.