TYPICAL SPECIFICATION
ECP Steel Pier™ PPB-166 Slab Jack System

Section 1- General

1.01 Typical Installation Scope

Furnish labor, equipment, tools and material to install Model 166 Piers as described in this specification in a workmanlike manner and to design criteria.

1. Prepare site for safe working conditions.
2. Thoroughly investigate the site for any and all underground utilities before excavating.
3. Core drill access in slab, excavate under slab as required for installation of the product.
4. Prepare area under slab for bracket mounting.
5. Install ECP PPB-166 Slab Jack™ bracket and drive stand unit.
6. Securely anchor the drive stand and pier bracket to the floor.
7. Install the drive cylinder and connect hydraulics.
8. Hydraulically drive the steel pier sections to the required installation force.
9. Install lift assemblies, hydraulic lift cylinders and connect hydraulics to all placements.
10. Transfer the load to the piers; lift the concrete slab to designed specifications or as much as the slab construction permits and mechanically secure to maintain elevation.
11. Remove equipment from work area.
12. Install lean concrete or other suitable fill material in the void.
13. Fill core drilled holes with concrete to finish floor elevation
14. Clean work areas.

1.02 Delivery, Storage and Handling

All foundation repair products, tools and equipment shall be handled and transported with care to prevent any damage or deformation. Hydraulic components shall be protected from the weather and kept clean of any dust, dirt, mud or debris.

Section 2 – Product Material

2.01 Pier Sections

Each pier section shall be manufactured from plain steel pipe 1-1/4" diameter Schedule 40 by 36" long. The materials conform to ASTM A53 and shall have an outside diameter of 1.660" and a wall thickness of 0.140".

201A Alternate Pier Sections

Each acceptable alternate pier section shall be manufactured from steel tubing having a nominal outside diameter of 2-7/8" outside diameter and a wall thickness of 0.165" and 36" long. The pier sections shall be fabricated from mill rolled, induction heat treated steel with a minimum yield strength of 55,000 psi. Each pier section shall have a mill-installed coating of zinc-iron alloy, pure zinc galvanizing, a layer of zinc chromate compounds and a clear organic polymer coating. The materials conform to ASTM A500.

2.011 Lead Section – PPB-166-S

The lead section shall have a friction reduction collar welded to the bottom end of the pier pipe. The collar shall be fabricated from steel tubing having a nominal 2.000" outside diameter by 0.134" wall with a length of 1". The purpose of the collar is to reduce skin friction on the pier sections that follow; therefore the first section of pier pipe must have this collar attached.

2.011A Alternate Lead Section – PPB-300-S

The lead section shall have a friction reduction collar welded to the bottom end of the pier pipe. The collar shall be fabricated from steel tubing having a nominal 3-3/8" outside diameter by 0.188" wall with a length of 1". The purpose of the collar is to reduce skin friction on the pier sections that follow; therefore the first section of pier pipe must have this collar attached.

2.012 Extension Section – PPB-166-EPSB

The extension section shall have a coupling installed on one end of the pier pipe. This coupling shall be fabricated from one inch schedule 40 pipe having a nominal 1.315" outside diameter by 0.133" wall thickness with a length of 7-7/8". Three inches of the coupling shall be inserted into the pier section and secured by one 7/16" plug weld.

2.012A Alternate Extension Section – PPB-300-EPS

The extension section shall have a coupling installed on one end of the pier pipe. This coupling shall be fabricated from steel tubing having a nominal 2-1/2" outside diameter by 0.180" wall thickness with a length of 5-7/8". Three inches of the coupling shall be inserted into the pier section and secured by two 1/2" plug welds.

2.02 Pier Bracket Assembly – PPB-166

2.021 Bearing Plate

The bearing plate shall be welded assembly designed to mount under the slab and connect to the pier and to transfer the load of the floor to the pier pipe. The bearing plate shall measure 6" by 16" and have a thickness of one inch conforming

to ASTM A-36. The pier bracket shall have approximately 46 square inch horizontal bearing surface in contacts with the bottom of the slab. The bearing plate shall have two 3/4 inch nuts welded to the underside to accept all threaded bars used for attachment to the driving equipment and the pier cap

2.022 Pier Cap
The pier cap connects the pier pipe to the bearing plate and transfers the structural load to the pier pipe. The pier cap shall be a welded assembly fabricated from one inch thick steel plate that measures 3-1/2 by 7 inches long conforming to ASTM A-36 Gr. 50. The pier cap has two 7/8 inch diameter holes for attaching the pier cap to the bearing plate. An alignment ring shall be attached to the bottom side of the pier cap to retain and align the selected pier pipe.

2.023 Bracket Lift Rods and Hex Nuts
Supplied with the pier bracket assembly shall be two 3/4-10 all thread bars conforming to ASTM A-193 Grade B5 that measure 14 inches long and four 3/4-10 hex nuts. The bracket lift rods and nuts shall be used to attach the pier cap to the pier bracket. These items provide for a maximum lift of the pier system of 4". Larger lifts may be accomplished by using longer bracket rods.

Section 3 – Tools and Equipment

3.01 Drive Stand – PPB-166-DS
The proprietary drive stand is a welded assembly designed to maintain vertical alignment of the bearing plate, drive cylinder and pier pipe during pier installation. The drive stand shall be a welded assembly of 3/16", 1/4", 3/8", 3/4" and 1" thick hot rolled steel conforming to ASTM A-29. In addition there shall be four 2-7/8" dia. x 0.203 pieces of tubing 35-3/8" long. The tubing shall conform to ASTM A53 with a minimum yield of 35,000 psi. Supplied with the drive stand shall be four 7/8" diameter B-7 all thread bar and four hex nuts for attachment of the drive stand to the bearing plate. Four 3/4"-10 hex bolts and nuts, Grade 5 shall be supplied for attachment of the drive stand to the four 2-7/8" tubes.

3.02 Drive Cylinder Assembly – PPB-300-DC
The drive cylinder assembly shall be a double acting with a special cylinder head designed to fit the proprietary drive stand, a rod aligner and a pier drive adapter on the end of the piston rod designed to install the 2-7/8" diameter by 0.165 wall thickness pier pipe. The drive cylinder shall have a 2-3/4" diameter bore and 1-3/4" diameter cylinder rod. The stroke shall be 24". Working pressure may vary from 3,000 to 10,000 depending upon the cylinder used by the installer**.**

CAUTION: The operator must identify which cylinder he is using and verify the working pressure of the cylinder prior to using the hydraulics.

3.03 Hydraulic Pumps

3.031 Pier Installation Pump – HYD-5420
A gasoline or electrically operated hydraulic pump is required to install the pier pipe. The pump shall be capable of providing 10,000 psi of hydraulic pressure and a dual flow rate of 480 in^3/min up to 2,000 psi and a rate of 100 in^3/min above 2,000 psi. The pump shall have a 4-way, 3 position valve for double acting cylinder service. (Enerpac PGM-5204R or equal)

3.032 Hand Pump – HYD-801
One or more hand pumps may be required to transfer structural load and to recover lost elevation. The hand pump(s) are connected to hydraulic lifting rams via a manifold arrangement. This provides uniform force to several pier placements at the same time. The hand pump assembly shall provide two stages of displacement at pressures up to 10,000 psi. Below 400 psi the displacement shall be 2.4 in^3 per stroke and above 400 psi, 0.15 in^3. (Enerpac P801 or equal)

3.04 Single Acting Hydraulic Cylinder – HYD-254
A single acting hydraulic cylinder shall be positioned at each placement during the load transfer phase of the restoration. The hydraulic cylinder shall be rated at 10,000 psi of hydraulic pressure and heavy duty return spring. The minimum cylinder bore shall be 5.16 in^2 and a stroke of 4". (Enerpac RC-254 or equal)

3.05 Pressure Gauges

3.051 Drive Cylinder Pressure Gauge – HYD-4088
A pressure gauge shall be provided to monitor the installation force placed upon the pier pipe. The gauge shall be capable of measuring 0 – 10,000 psi with a minimum gauge face of 4" and minor graduations of 100 psi. (Enerpac G4088L or equal)

3.052 Hand Pump Pressure Gauge – HYD-2535
A pressure gauge shall be provided to monitor the lifting force applied to the structure during restoration. The pressure gauge shall be capable of measuring 0 – 10,000 psi with a minimum gauge face of 2-1/2" and minor graduations of 200 psi. (Enerpac G2535L or equal)

Section 4 – Steel Pier Installation

Warning!

Utilities:	**Thoroughly investigate the job site for the possible existence and location of all underground utilities before proceeding. Avoid any contact with ALL underground utilities!**
Pier Placement:	**Excessive distance between pier placements can damage the concrete slab from structural overload. Verify that the slab has sufficient structural integrity and steel reinforcement to withstand the driving and lifting loads.**
Drive Cylinder:	**Verify the working pressure of the hydraulic drive cylinder prior to using the hydraulics. Do not exceed the hydraulic drive cylinder manufacturer's working pressure during pier installation. When operating near the maximum cylinder pressure, cylinder rod extension should be restricted to no more than 15 inches to prevent damage to the drive cylinder actuator rod.**
Hydraulic Equipment:	**Inspect all hydraulic equipment prior to using. Do not use any leaking or damaged components such as cracked, crimped or cut hoses, leaking fittings, etc.**
Heavy Lifting:	**Many pieces of equipment used to install steel foundation underpinning are very heavy. Use proper lifting techniques, back supports, and help from others when lifting heavy objects.**
Safety Devices:	**When driving pier pipe all face plates must be fastened in place on the drive stand and pier bracket to enhance the integrity of the system and to secure the pier pipe.**
Safety Devices:	**All persons in and around the work area must use personal safety protection.**

Warning! **FAILURE TO HEED THESE WARNINGS OR TO FOLLOW SAFE WORK HABITS MAY RESULT IN SERIOUS INJURY OR DEATH!**

4.01 Core Drill the Slab and Verify the Slab Integrity and Determine Placements

The slab shall be core drilled using an eight inch diameter drill. After the initial hole is drilled, the slab thickness and slab integrity shall be determined prior to determining the placements across the floor. Prior to any further drilling, measure the actual thickness of the slab and verify the quality of the slab construction. The steel reinforcement shall be verified to exist and shall be verified as properly embedded within the slab to provide tension strength within the concrete slab during lifting. Un reinforced slabs or slab reinforcement that is not fully embedded within the concrete shall be rejected as not suitable for repair and work shall cease and the engineer shall be informed.

4.02 Determine Pier Spacing, Core Drill All Placement Locations and Excavate Soil

A general rule of thumb for spacing the slab piers on a suitably reinforced slab on grade is to measure the actual thickness of the slab and then space the piers across the damaged slab at center-to-center distance of no more than one foot of distance for each inch of thickness of the reinforced slab, plus one foot. (For example: A slab that has a minimum thickness of 3-1/4 inches shall have placements not to exceed 4-1/4 feet.) The recommended spacing from the edges of the concrete is one half of the center to center spacing. All placement locations shall be core drilled using an eight inch diameter drill. An area below the slab in at each of the drilled hole shall be hand excavated to a minimum 5 inch undercut below the slab to create an 18" diameter hole (approximate) to a depth of 12 to 14 inches below the bottom of the slab.

4.03 Drive Stand Installation

Smooth the bottom side of the concrete slab in the area where the bearing plate will be attached. Place the bearing plate onto the cavity and test the fit to the concrete. If the contact between the bottom of the slab and the bearing plate is not complete and continuous, then a thin layer of high strength no-shrink grout shall be placed on the bearing surfaces of the bearing plate prior to installation.

Position the drive stand over the hole and secure the bearing plate to the drive stand using the two all-threaded rods supplied with the drive stand. Nuts on the rods shall be tightened snugly to bring the bearing plate into contact with the bottom of the slab. Do not over tighten the nuts. Allow sufficient time as recommended by the manufacture of the grout for the no-shrink grout to set before driving the pier pipe.

Install the drive cylinder on to the drive stand and connect the hydraulics. Install sufficient reaction weights around the area of the pier to allow the pier to be load tested once firm bearing has been reached.

4.04 Driving Pier Pipe
Drive the lead pier section into the soil using the hydraulic drive cylinder to nearly the full extension of the cylinder rod. Retract the cylinder rod; install the coupling shoulder of a drive tool into the top of the installed pier section. Drive the pier downward into the soil again to the length of the hydraulic drive cylinder stroke. Repeat this operation with an additional drive tool as required to fully install the pier pipe. Retract the cylinder rod; remove the drive tool. Document the force used to drive each section of pier pipe. Install the coupled end of an extension pier section into the top of the driven pier section. The pier installation process shall continue adding extension pier sections until the design load or a suitable bearing stratum is reached. Hold the final driving load on the pier to check for pier creep.

4.05 Field Proof Loading
Load test the pier to the required proof load above the design or working load, or until lift of the slab is encountered. The magnitude of the proof load is totally dependent upon the integrity of the slab and the amount of reaction weight provided adjacent to the pier during installation. We do not recommend proof loading the system to a load greater than 16,500 pounds, which is 1.5 times the anticipated maximum possible service load. Document the results. Remove hydraulic drive cylinder and drive stand from the bearing plate, and remove the supplemental reaction weight from the floor around the pier.

4.06 Cutting Final Pier Section to Length
After verifying the pier capacity, it may be necessary to cut the final pier section. The pier pipe shall be cut very carefully to insure that the cut is perpendicular to the axis of the pipe. The bearing plate is shipped with bracket lift rods sized for lifts up to 4". For larger lifts, longer bracket lift rods are required. For most projects with lifts less than 4", the length of the final pier section must be cut to allow it to protrude above the top of the pier bracket approximately 4". The length to cut the pier section will vary depending upon the required lift. Once lifted, the pier cap should be no closer than two inches below the surface of the slab.

4.07 Load Transfer
Transfer the weight of the floor to the piers uniformly and evenly by activating hydraulic rams at the pier placements simultaneously. A pier cap, lift assembly and bracket lift rods shall be installed with nuts on each bracket. A 25-ton ram shall then be placed between each pier cap and lift assembly. Each ram shall be connected through a cut-off valve to one or more manifolds, gauge, and hydraulic hand pump systems. As the hand pump is actuated, force is applied to the pier caps. As the floor weight is transferred from the slab to the piers, the condition and elevation of the slab must be carefully monitored to insure that the restoration occurs to plan and the floor is lifted to as close to the design elevation as the slab construction permits. As each placement reaches the desired elevation, the cut-off valve for the ram at the pier is closed and the pressure recorded for that placement. The hex nuts at the top of the bracket rods and above the pier caps shall be advanced to the surface of the pier cap and secured.

Remove the lift assemblies, hydraulic rams and lifting hydraulics from each bearing plate placement. Clean all hydraulics, replace dust caps on the hydraulic couplings and store the equipment in a clean, dry environment.

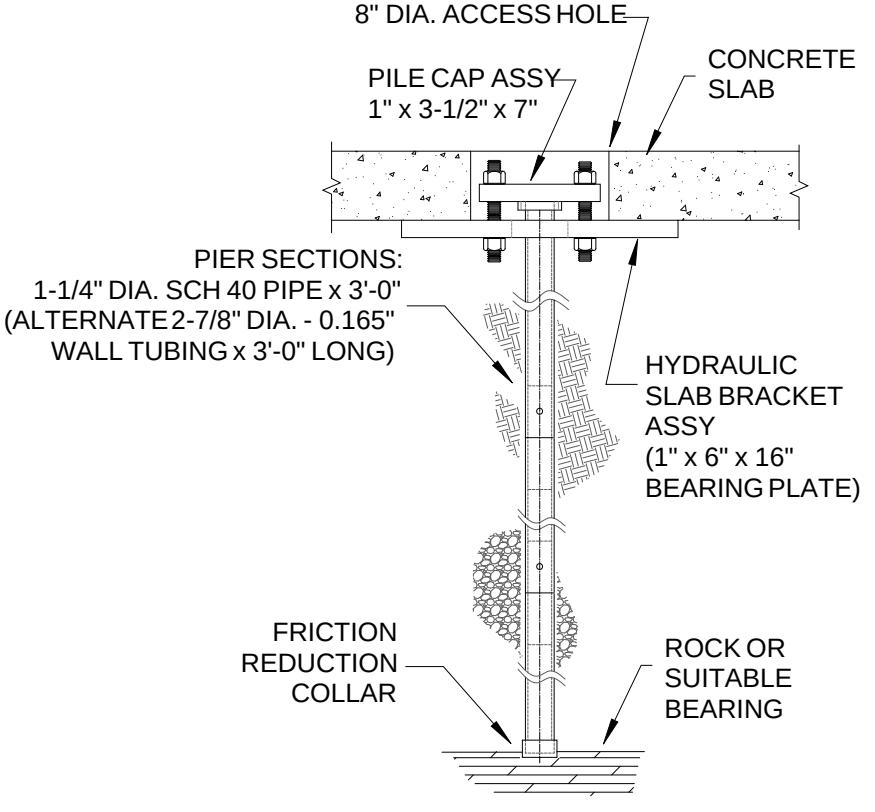
4.08 Filling the Void
After the restoration is complete the void created between the concrete floor slab and soil must be filled with low strength, flow able grout or other acceptable fill material, depending upon the slab construction, type of soil on the site and the amount of lift. Consult a registered professional engineer when in doubt. The void shall not be "pressure grouted", but rather filled by pumping the grout under low pressure until the grout fills the entire void under the slab. CAUTION: In areas with highly expansive clay soil, the moisture content of the grout must be controlled to prevent heaving of the underlying soil after grout installation.

4.09 Backfill and Cleanup
Remove all scrap and other construction debris from the site. Remove all tools and equipment, clean them and store them. The cored holes in the slab shall now be repaired using premixed concrete provided in convenient sacks or no shrink grout. Finish the concrete to match the elevation and texture of the existing floor. Dispose of all construction debris in a safe and legal manner.

END OF SPECIFICATION

ECP Steel Pier™ -- Model 166 Slab Jack Pier System

- **Ultimate Limit Capacity – 22,000 lb**
- **Maximum Proof Load – 16,500 lb**
- **46 Square Inches Bearing Surface**
- **Standard Lift – 4”**
- **Fully Adjustable Unlimited Lift Capability**
- **Installs Through the Slab**
- **Friction Reduction Collar On Lead Pier Section**
- **1-1/4” or 2-7/8” Diameter Galvanized Tubular Pier**
- **Installs With Portable Equipment**
- **Installed With Little or No Vibration**
- **100% of Piers Proof Tested After Installation**
- **Manufacturer’s Warranty**



ECP Typical Specifications

The capacity of the Model 166 foundation support system is a function of the strength of the concrete slab, the capacity of pier pipe and soil surrounding the pipe, the capacity of the firm end bearing stratum, capacity of the foundation bracket, and strength of the bracket to foundation connection. Actual capacities could be much lower than the bracket capacity.

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