# MODEL SPECIFICATION

# ATLAS RESISTANCE® STANDARD, HEAVY DUTY and MODIFIED 2-PIECE PIER SYSTEMS

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## Atlas Resistance® Standard, Heavy Duty and Modified 2-Piece Systems

- AP-2-UF-2875.165
- AP-2-UF-2875.165M (Modified)
- AP-2-UF-3500.165
- AP-2-UF-3500.165M (Modified)
- AP-2-UF-4000.219
- AP-2-UF-4500.237

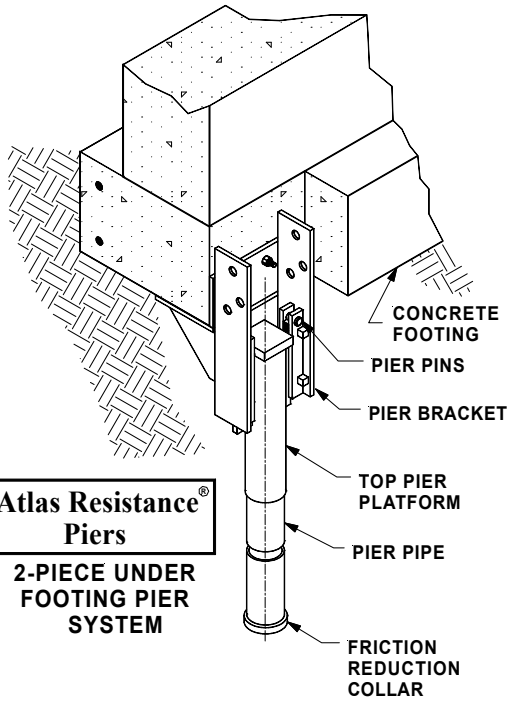
## Atlas Resistance® 2-Piece Plate Pier Systems

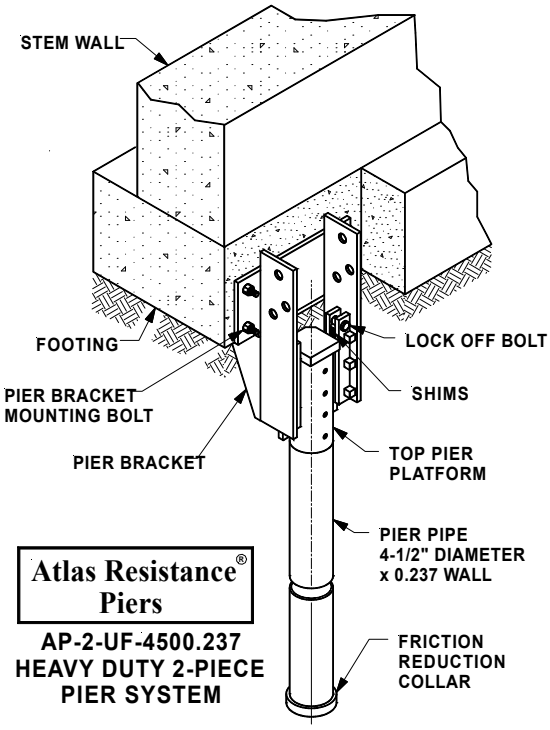
FLAT PLATE PIERS

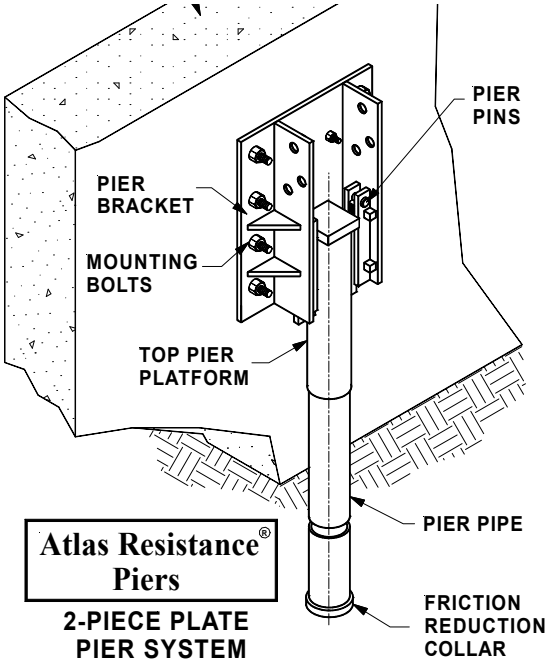
- AP-2-PP-2875.165
- AP-2-PP-2875.165 (Modified)
- AP-2-PP-3500.165
- AP-2-PP-3500.165M (Modified)
- AP-2-PP-4000.219
- AP-2-PP-4500.237

CURVED PLATE PIERS

- AP-2-PPRC-2875.165
- AP-2-PPRC-3500.165M (Modified)
- AP-2-PPRC-4000.219



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# MODEL SPECIFICATION
# ATLAS RESISTANCE® STANDARD, HEAVY DUTY, AND MODIFIED 2-PIECE PIER SYSTEMS

## 1 GENERAL

### 1.1 SCOPE of WORK

This work consists of furnishing all labor, tools, equipment and materials associated with the preparation and installation of Atlas Resistance® 2-Piece Piers according to the specifications contained herein. The work includes, but is not limited to, the following:

a. Diligent investigation of the possible existence and location of underground utilities situated at or near the area of work;
b. All soil excavation;
c. Preparation of the footing and stem wall or foundation grade beam;
d. Mounting the pier bracket including the drive stand assembly with concrete anchors;
e. Installation of pier sections to designed specifications;
f. Cutting the last extension section to the specified elevation, if required, and installing sleeving (optional);
g. Installation of the top pier platform and two-piece lift head assembly;
h. Lifting of the structure with hydraulic rams and the restoration of the structure to a permanent elevation;
i. Replacement of the soil and general site clean up.

### 1.2 REFERENCES

a. CHANCE® Civil Construction Technical Design Manual, latest version.
b. National Evaluation Service, Inc. (NES) National Evaluation Report No. NER-579; Atlas Piers AP-2-UF3500.165 Series and AP-2-UF-3500.165M Series
c. ASTM Standard Specifications, most recent versions.
   (1) ASTM A29 Standard Specification for Steel Bars, Carbon and Alloy, Hot Wrought and Cold Finished
   (2) ASTM A36 Standard Specification for Carbon Structural Steel
   (3) ASTM A53 Standard Specification for Welded and Seamless Steel Pipe
   (4) ASTM A500B Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
   (5) ASTM A513 Standard Specification for Electric Resistance Welded Carbon and Alloy Steel Mechanical Tubing
   (6) ASTM A572 Standard Specification for High Strength Low Alloy Columbium –Vanadium Structural Steel

### 1.3 DELIVERY, STORAGE and HANDLING

All pier materials shall be handled and transported carefully to prevent any deformation or damage. Care should be taken to prevent the accumulation of dirt, mud or other foreign matter on the steel materials. Such accumulation shall be completely removed prior to installation.

## 2 MATERIAL

### 2.1 PIER BRACKET

#### 2.1.1 Standard 2-Piece Pier Bracket (AP-2-UF-2875.165 and -2875.165M Piers)

The pier bracket for the 2-7/8" diameter pier shall be a welded assembly of 5/8" and 1/2" thick steel plates conforming to ASTM A36. The pier bracket shall provide 69 $in^2$ of bearing surface against the bottom of the footing and a minimum of 48 $in^2$ against the vertical face of the foundation. The pier bracket shall have guides for the top pier platform, two 9/16" diameter bracket mounting holes, two 11/16" diameter pier pin holes and four 1-1/32" diameter alignment and equipment mounting holes.

#### 2.2.1 Standard 2-Piece Pier Bracket (AP-2-UF-3500.165, -3500.165M, and -4000.219 Piers)

The pier bracket for the 3-1/2" or 4" diameter pier shall be a welded assembly of 5/8" and 1/2" thick steel plates conforming to ASTM A36. The pier bracket shall provide 74 $in^2$ of bearing surface against the bottom of the footing and a minimum of 59 $in^2$ against the vertical face of the foundation. The pier bracket shall have guides for the top pier

platform, two 9/16" diameter bracket mounting holes, two 11/16" diameter pier pin holes and six 1-1/32" diameter alignment and equipment mounting holes.

2.1.3 Heavy Duty 2-Piece Pier Bracket (AP-2-UF-4500.237 Pier)

The pier bracket shall be a welded assembly of 1", 5/8" and 1/2" thick steel plates conforming to ASTM A36. The pier bracket shall provide 74 $in^2$ of bearing surface against the bottom of the footing and a minimum of 128 $in^2$ against the vertical face of the foundation. The pier bracket shall have guides for the top pier platform, four 9/16" diameter bracket mounting holes, two 7/8" diameter pier pin holes and six 1-1/32" diameter alignment and equipment mounting holes.

2.1.4 Flat 2-Piece Plate Pier Bracket (AP-2-PP-2875.165 and AP-2-PP-2875.165M Piers)

The pier bracket shall be a welded assembly of 5/8" and 1/2" thick steel plates conforming to ASTM A36. The pier bracket shall provide 270 $in^2$ of surface contact against a vertical face of the stem wall or column. The pier bracket shall have guides for the top pier platform, eight 7/8" diameter bracket mounting holes, two 11/16" diameter pier pin holes and six 1-1/32" diameter alignment and equipment mounting holes.

2.1.5 Flat 2-Piece Plate Pier Bracket (AP-2-PP-3500.165, -3500.165M and -4000.219 Piers)

The pier bracket shall be a welded assembly of 5/8" and 1/2" thick steel plates conforming to ASTM A36. The pier bracket shall provide 320 $in^2$ of surface contact against a vertical face of the stem wall or column. The pier bracket shall have guides for the top pier platform, eight bracket mounting holes consisting of four 7/8" diameter and four 1-1/8" diameter holes, two 11/16" diameter pier pin holes and six 1-1/32" diameter alignment and equipment mounting holes.

2.1.6 Curved 2-Piece Plate Pier Bracket (AP-2-PPRC-2875.165, -3500.165M and -4000.219 Piers)

The AP-2-PPRC series of pier brackets are constructed as specified in Section 2.1.4 and 2.1.5 with the exception that the plate that mounts against the circular column shall be custom fabricated to conform to the diameter of the column.

2.2 ANCHOR BOLTS

2.2.1 2-Piece Underfooting Pier Anchor Bolts

Each underfooting pier bracket requires two 1/2" diameter by 5-1/2" long (minimum) steel concrete expansion bolts (four required for the 4-1/2" diameter heavy duty 2-piece pier), cadmium plated with an ultimate pullout capacity of 8,000 lbs in 3,000 psi concrete. Minimum embedment shall be 3-1/2". The anchor bolts shall be supplied with a flat washer and nut. The drive stand requires two (minimum) 1/2" diameter by 5-1/2" long (minimum) steel concrete expansion bolts (Hilti Kwik Bolt II Expansion Anchors or equivalent) for temporary mounting during pier installation. Bolts are required for mounting only.

2.2.2 2-Piece Plate Pier Anchor Bolts (AP-2-PP-2875.165 and AP-PPRC-2875.165 Piers)

Each pier bracket requires eight 3/4" diameter by 7-1/2" long steel cadmium plated concrete expansion bolts, (Hilti Kwik Bolt II Expansion Anchors or equivalent), with a minimum embedment of 4-3/4". Ultimate pullout capacity shall be 15,000 lbs in 3,000 psi concrete. Anchor bolts shall be supplied with a flat washer and nut.

2.2.3 2-Piece Plate Pier Anchor Bolts (All other AP-2-PP- and AP-2-PPRC- Series Piers)

Each pier bracket requires four 3/4" diameter by 7-1/2" long cadmium plated steel concrete expansion bolts (Hilti Kwik Bolt II Expansion Anchors or equivalent) with a minimum embedment of 4-3/4". Ultimate pullout capacity shall be 15,000 lbs in 3,000 psi concrete; and four 1" diameter by 9" long cadmium plated steel concrete expansion bolts (Hilt Kwik Bolt II Expansion Anchors or equivalent) with a minimum embedment 5-1/2". Ultimate pullout capacity shall be 22,000 lbs in 3,000 psi concrete. (Lighter bolt designs may be used with lighter load applications if approved by the engineer.) Anchor bolts shall be supplied with a flat washer and nut.

2.3 GROUT (Optional)

2.3.1 Pressure Bearing Grout

Quick setting premixed mortar with a 4,500 psi minimum three day strength (Master Builder's 713 Non-Shrink Grout or equivalent).

2.3.2 Flowable Pipe Grout

Quick setting, neat cement flowable grout with a 4,000 psi (minimum), three day strength.

2.3.3 Flowable Grout Fill

The grout slurry shall consist of sand, soil or other suitable void fill material mixed with any recognized lubricant such as 12% cement (2-1/2 sack mix), bentonite or other lubricant to promote proper flow characteristics.

2.4 DRIVE STAND ASSEMBLY

The drive stand assembly is a welded steel frame with a double acting hydraulic actuator capable of pressing the 42" long steel pier sections through the soil to a load bearing strata. The drive stand assembly is temporarily attached to the pier bracket by means of 1" diameter by 2-3/4" long high strength locking pins. Attach the drive stand assembly to the wall using two (minimum) 3/4" diameter by 7-1/2" long (minimum) anchor bolts to provide drive cylinder alignment and stability.

2.5 PIER SECTION

2.5.1 Pier Section (2-7/8” Diameter x 0.165” Wall Thickness)

Each pier section shall be fabricated from a 2-7/8" OD by 42" long, mill rolled, induction heat treated, steel section with a 0.165" wall thickness. The initial section shall have a 1" long collar welded to the lead end of the pipe with a 3-1/2" OD to assist in reducing wall friction during driving of the pier to capacity. The pier sections that follow shall each have a coupling welded to one end. Steel in this section shall conform to ASTM A500 Grade B.

2.5.2 Standard Pier Section (3-1/2” Diameter x 0.165” Wall Thickness)

Each pier section shall be fabricated from a 3-1/2" OD by 42" long mill rolled galvanized steel section with a 0.165" wall thickness. A triple coat corrosion protection of zinc chromate and clear polymer coating shall be provided. The initial section shall have a 4" OD by 1" long collar welded to the lead end of the pipe to assist in reducing wall friction during driving of the pier to capacity. The pier sections that follow shall each have a coupling welded to one end. Steel in this section shall conform to ASTM A500 Grade B.

2.5.3 Pier Section (4” Diameter x 0.219” Wall Thickness)

Each pier section shall be fabricated from a 4" OD by 42" long mill rolled steel section with a 0.219" wall thickness. The initial section shall have a 4-1/2" OD by 1" long collar welded to the lead end of the pipe to assist in reducing wall friction during driving of the pier to capacity. The pier sections that follow shall each have a coupling welded to one end. Steel in this section shall conform to ASTM A500 Grade B.

2.5.4 Heavy Duty Pier Section (4-1/2” Diameter x 0.237” Wall Thickness)

Each pier section shall be fabricated from a 4-1/2" diameter, 0.237" wall pipe. The initial section shall have a 5" OD by 1" long collar welded to the lead end of the pipe to assist in reducing wall friction during driving of the pier to capacity. The pier sections that follow shall each have a coupling welded to one end. Steel in this section shall conform to ASTM A500 Grade B.

2.6 COUPLING

The pier coupling shall be a 6" long tubular steel section of suitable diameter to fit inside the pier section. The coupling shall be inserted and attached 3" inside one end of each pier section that follows the initial pier section. The remaining 3" of the coupling extends beyond the pier section. All components shall conform to ASTM A513 or ASTM A500 Grade B. The coupling shall be attached by an embossed mechanical connection or by plug welding the coupling to the pier pipe.

2.7 MODIFIED SLEEVE PIER SECTION (Modified Pier Only)

The modified sleeve pier section shall be fabricated from a 3-1/2" diameter, 0.216" thick wall or 4" diameter, 0.219 inch thick wall mill rolled steel pipe, by 42 inches long. The pipe sleeve is mounted over the last pier section and is used to increase the moment transfer capacity from the Top pier Platform to the pier section. Steel in this section shall conform to ASTM A500 Grade B or A53.

2.8 PIER SLEEVING (Optional)

Pier sleeving is used to stiffen the segmented joints through areas of weak soils. Depending upon the product, the sleeve sections shall be fabricated from 3" diameter, Schedule 40 pipe, or 4" diameter, 0.219" thick wall mill rolled steel pipe, or 4-1/2" diameter, 0.237" thick wall mill rolled steel pipe 42" long. The sleeving shall be driven over the pier sections through any area of weak soils. The sleeving shall be installed in such a manner that the joints in the pier and the joints in the sleeving shall be staggered by at least 18". Steel in this section shall conform to ASTM A53, ASTM A500 Grade B.

## 2.9 TOP PIER PLATFORM

### 2.9.1 Top Pier Platform for Standard, Modified and Plate Piers

The standard pier platform shall be a welded assembly consisting of a steel tube of suitable size to fit over the pier section that shall form the cap cylinder. The length of the tube shall be 16-5/8" long for the 2-7/8" diameter pier products and 17-3/4" long for others with the exception of the 4" diameter modified pier system, which shall have a tube 41-3/4" long. The cap cylinder shall have two 10" long (8" long for 2-7/8" diameter pier products) by 5/8" thick steel plates welded as vertical stabilizers to the sides of the steel cap cylinder. The top of the top pier platform shall be a 1" thick (3/4" thick for 2-7/8" diameter pier products) steel plate welded to the top of the cap cylinder. All steel elements shall conform to ASTM A36, ASTM A53, or ASTM A500 Grade B.

### 2.9.2 Top Pier Platform for AP-2-UF-4500.237

A 4" outside diameter by 20" long steel pipe shall be welded to the inside of a 4-1/2" OD by 10" long steel pipe to form the cap cylinder. The cap cylinder shall have two 9-1/2" long by 5/8" thick steel plates welded as vertical stabilizers to the sides of the steel cap cylinder. At the top of the top pier platform shall be a 1" thick steel plate welded to the top of the cap cylinder. All steel elements shall conform to ASTM A36, ASTM A500 Grade B.

## 2.10 HIGH STRENGTH PIER PINS – LOCK OFF BOLTS

### 2.1.1 High Strength Pier Pins for Standard, Modified and Plate Piers

Two 5/8" diameter by 3" long high strength, heat treated cadmium plated pier pins (HDW-PIN-5/8[G][0'-3]) are required per pier. The pier pins conforming to ASTM A29 Grade 10B21 are required for each pier. The pins shall be quenched and tempered to HRC 36± and capable of providing 55,000 pounds of ultimate shear resistance in double shear configuration.

### 2.1.2 High Strength Lock Off Bolts for AP-2-UF-4500.237

Two 3/4" diameter by 4" long high strength hex bolts are used as pier pins. The bolts shall conform to SAE J429 and be equivalent to Grade 8.

## 2.11 LIFT SHIMS

The lift shims shall be 7 gauge, 5/8" by 1-1/2" long cadmium plated hot rolled steel. Lift shims are used as required up to a maximum height of 4"s. Final adjustments shall be made with one or two 16 gauge, 5/8" by 1-1/2" long cadmium plated hot rolled steel shims. The steel shall conform to ASTM A36.

## 2.12 TWO PIECE LIFT HEAD ASSEMBLY

The two piece lift head shall be a welded assembly that consists of 5/8" thick and 1" thick steel plates and is capable of providing the required resistance capacity for load transfer. The two piece lift head assembly is temporarily attached to the pier bracket by means of six high strength pins and locking clips measuring 1" in diameter by 2-3/4" long (four required for the 2-7/8" diameter products). The pins are inserted through matching 1-1/32" diameter holes in the pier bracket.

## 2.13 LATERAL SUPPORT DEVICE (Under Footing Brackets - AP-2-UF-Series Only)

The lateral support device is a specialized tool used to provide a horizontal force to the bottom of the under footing pier bracket during pier section installation. The lateral support device helps counteract the torque developed between the structure and the pier bracket during pier section installation. The lateral support device is a welded assembly of steel plate and tubing. Its length is adjustable by means of a hand thread and a steel pin inserted through adjustment holes in the lateral support device.

## 2.14 WELDMENTS

All welded connections shall conform to the requirements of the American Welding Society (AWS) publication "Structural Welding Code AWS D1.1", and applicable revisions.

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## 3 EXECUTION

The following is intended to provide the controlling specification for the installation of each Atlas Resistance® Pier System.

**WARNING! THOROUGHLY INVESTIGATE THE PRESENCE AND LOCATION OF ALL UNDERGROUND UTILITIES SITUATED AT OR NEAR THE AREA OF WORK BEFORE PROCEEDING. SERIOUS INJURY MAY RESULT FROM FAILURE TO LOCATE AND AVOID CONTACT WITH UNDERGROUND UTILITIES.**

**COLLAPSE OF SOIL CAN CAUSE VERY SERIOUS INJURY. DO NOT ENTER ANY EXCAVATION IF THERE ARE ANY QUESTIONS ABOUT THE STABILITY OF THE SOIL MASS. CONTACT THE ENGINEER OF RECORD OR CAREFULLY FOLLOW OSHA REQUIREMENTS AND/OR LOCAL REGULATIONS.**

**THE DRIVE STAND AND DRIVE CYLINDER ARE VERY HEAVY. USE PROPER LIFTING AND HANDLING TECHNIQUES. BE CONSTANTLY AWARE OF THE DRIVE CYLINDER'S POSITION IN THE DRIVE STAND AND THE ALIGNMENT OF THE PIER SYSTEM COMPONENTS. DO NOT LET THE CYLINDER WORK ITS WAY OUT OF POSITION. MONITOR THE FOOTING AND STRUCTURE CLOSELY FOR CRACKS. DO NOT EXCEED THE HYDRAULIC CYLINDER MANUFACTURER'S WORKING PRESSURE WHEN DRIVING THE PIER SECTIONS. BEWARE OF HOT, HIGH-PRESSURE HYDRAULIC OIL. SERIOUS INJURY MAY RESULT FROM NOT FOLLOWING PROPER SAFETY TECHNIQUES.**

### 3.1 EXPOSURE of FOOTING or GRADE BEAM

An area shall be excavated immediately adjacent to the building foundation to expose the footing, bottom of the grade beam, stem wall or column to a width of at least 36" and at least 15" beneath the proposed elevation of the base of the pier bracket. A chipping hammer shall be used to smooth and prepare the foundation for mounting of the pier bracket. The stem wall or column shall be smooth and vertical at the mounting location for the plate pier bracket. The vertical and bottom face of the footing shall, to the extent possible, be smooth and at right angles to each other for mounting the under-footing bracket. The spread footing, if present, shall be notched to allow the AP-2-UF-Series Pier Bracket to mount directly under the bearing load of the stem wall, or shall be core drilled to allow the pier pipe from the AP-2-PP-Series Plate Pier to be installed. DO NOT cut any reinforcing steel in the footing element without approval from the engineer. The surfaces shall be smooth, free of all dirt, debris, and loose concrete so as to provide firm bearing surfaces for the pier bracket.

### 3.2 INSTALLATION of the PIER BRACKET

**WARNING! CAREFULLY SPACE THE PIER BRACKETS ALONG THE FOOTING SO THAT THE STRUCTURE IS NOT OVER-SPANNED. EXCESSIVE PIER SPACING CAN CAUSE DAMAGE TO THE CONCRETE FOOTING, STEM WALL AND/OR SLAB FROM STRUCTURAL OVERLOAD. ENSURE THAT THE NECESSARY EXISTING STRUCTURAL CONSIDERATIONS HAVE BEEN ADDRESSED BEFORE ATTEMPTING TO LIFT OR STABILIZE A STRUCTURE.**

#### 3.2.1 Installation of the Under-Footing 2-Piece Pier Bracket

The pier bracket shall be temporarily mounted to the drive stand assembly using 1" diameter pins and retaining clips. The assembly is lowered into the excavation adjacent to the foundation. The pier bracket shall then be positioned and seated flush against the face and bottom of the footing using a hydraulic actuator or ram. The pier bracket is then fastened to the footing with two expansion anchor bolts. If the pier bracket does not have continuous bearing support on either the vertical or horizontal face, then pressure bearing grout shall be used to provide proper bearing prior to driving the pier. Care should be exercised to ensure that the drive stand assembly frame is plumb prior to driving each pier section. A carpenter's level may be used to verify vertical alignment in both planes.

**WARNING! INCORRECT PREPARATION OF THE FOOTING MAY ALLOW THE PIER BRACKET TO ROTATE AND SHEAR THE MOUNTING BOLTS. ROTATION OF THE PIER BRACKET CAN DAMAGE THE FOOTING, PIER, AND INSTALLATION EQUIPMENT. IN ADDITION, SERIOUS INJURY MAY OCCUR FROM FALLING EQUIPMENT DURING PIER INSTALLATION FROM BROKEN BOLTS.**

Install a lateral support device between the bottom, front side of the pier bracket and the vertical wall of the excavation opposite the pier. During installation of the pier sections, maintain support against the pier bracket with the lateral support device.

3.2.2 Installation of the 2-Piece Plate Pier Bracket

A bolt template shall be prepared to properly locate, mount and align the pier bracket at the location directed by the designer and, if a spread footing is present, directly over a cored hole installed through the footing element. When the anchor bolt locations are marked, the four 3/4" diameter x 7-1/2" long bolts shall be installed to a minimum embedment of 4-3/4" and the four 1" diameter x 9" long bolts shall be installed to a minimum embedment of 5-1/2" into the vertical face, unless otherwise directed by the engineer. (Note: The AP-2-PP-2875.165 pier requires only 3/4" diameter bolts.) The plate pier bracket shall be installed with the nuts and washers provided with the anchor bolts. The longer bolts mount to the lower holes. Follow manufacturer's recommendations for bolt installation and maintain maximum embedment of the bolts. If the pier bracket does not have continuous bearing support on the vertical face, then pressure bearing grout shall be used to provide proper bearing prior to driving the pier. Care should be exercised to ensure that the pier bracket is plumb. A carpenter's level may be used to verify the vertical alignment.

3.3 DRIVING and TESTING PIER SECTIONS

**WARNING! ENSURE THAT THE HYDRAULIC HOSES ARE PROPERLY CONNECTED TO THE REMOTE CONTROL VALVE. BE SURE THAT THE REMOTE CONTROL VALVE AND THE CONTROL VALVE ON THE PUMP ARE PLACED IN THE NEUTRAL (CENTER) POSITION BEFORE STARTING PUMP. OPERATE THE SYSTEM WITH THE PUMP CONTROL VALVE IN THE "B" POSITION ONLY. EQUIPMENT DAMAGE AND/OR SERIOUS PERSONAL INJURY MAY RESULT FROM IMPROPER HOSE CONNECTIONS OR FAILURE TO POSITION VALVES PROPERLY.**

3.3.1 Driving of Pier sections

All pier sections shall be continuously driven by use of the drive stand and hydraulic cylinder assembly. The initial pier section shall have the friction reduction collar on the bottom end. Additional pier sections shall be added as the pier driving operation continues. Driving of the pier sections will continue until rock or a suitable bearing stratum is reached as defined by a force equal to 1.65 times the working load specified by the engineer or until lift of the structure is achieved, whichever is less.

**WARNING! CHECK TIGHTNESS OF PIER BRACKET MOUNTING BOLTS OFTEN DURING PIER SECTION AND SLEEVE INSTALLATION. SERIOUS INJURY MAY RESULT FROM LOOSE BOLTS.**

**DO NOT EXCEED THE HYDRAULIC CYLINDER MANUFACTURER'S WORKING PRESSURE WHEN DRIVING THE PIER SECTIONS, ESPECIALLY WITH THE RAM FULLY EXTENDED. SERIOUS INJURY MAY RESULT.**

If the maximum hydraulic cylinder operating pressure is reached prior to bearing stratum verification, remove the double acting hydraulic actuator from the drive stand assembly and replace it with a 2" x 4" x 7-1/8" supplemental block. Install a 25 or 50 ton hydraulic ram (depending upon Proof Load force required) between the last pier section and the supplemental block. The hydraulic ram shall be actuated with a hand pump until bearing strata is verified as defined by a maximum installation force of 1.65 times the designed working load. The installation force shall not exceed:

| | |
|---|---|
| AP-2-UF-2875.165 and AP-2-PP-2875.165 (Standard 2-7/8" dia Pier Systems) | = 49,500 lbs., |
| AP-2-UF-2875.165M and AP-2-PP-2875.165M (Modified 2-7/8" dia Pier System) | = 57,750 lbs., |
| AP-2-UF-3500.165 and AP-2-PP-3500.165 (Standard 3-1/2" dia Pier Systems) | = 70,950 lbs., |
| AP-2-UF-3500.165M (Modified 3-1/2" dia Pier System) | = 75,075 lbs., |
| AP-2-PP-3500.165M (Modified 3-1/2" dia Pier System) | = 74,250 lbs., |
| AP-2-UF-4000.219 (Standard 4" dia Pier System) | = 80,850 lbs., |
| AP-2-PP-4000.219 (Standard 4" dia Pier System) | = 84,975 lbs., |
| AP-2-UF-4500.237(Standard 4-1/2" dia Heavy Duty Pier System) | = 116,325 lbs. |
| AP-2-PP-4500.237 (Standard 4-1/2" dia Heavy Duty Pier System) | = 92,400 lbs. |

or until lift of the structure is achieved, whichever is less.

3.3.2 Proof Load Testing (Optional)

To accomplish field load testing of the installed pier, CHANCE® Civil Construction recommends bearing capacity confirmation of 1.5 times the designed working load. This operation verifies a Factor of Safety of 1.5:1 on the field installation.

Proof Loading the pier may be accomplished by either installing a 2" x 4" x 7-1/8" supplemental block in place of the hydraulic drive cylinder on the drive stand or mounting a lift head on the pier bracket of existing work. Install a 25 or 50 ton hydraulic ram (depending upon Proof Load force required) between the pier and the supplemental block or lift head. The hydraulic ram shall be actuated with a hand pump until bearing strata is verified as defined by a maximum installation force of 1.5 times the designed working load not to exceed 1.5 times the maximum published working capacity. Do not exceed these maximum Proof Loads:

| | |
|---|---|
| AP-2-UF-2875.165 and AP-2-PP-2875.165 (Standard 2-7/8" dia Pier Systems) | = 45,000 lbs., |
| AP-2-UF-2875.165M and AP-2-PP-2875.165M (Modified 2-7/8" dia Pier System) | = 52,500 lbs., |
| AP-2-UF-3500.165 and AP-2-PP-3500.165 (Standard 3-1/2" dia Pier Systems) | = 64,500 lbs., |
| AP-2-UF-3500.165M (Modified 3-1/2" dia Pier System) | = 68,250 lbs., |
| AP-2-PP-3500.165M (Modified 3-1/2" dia Pier System) | = 67,500 lbs., |
| AP-2-UF-4000.219 (Standard 4" dia Pier System) | = 73,500 lbs., |
| AP-2-PP-4000.219 (Standard 4" dia Pier System) | = 77,250 lbs., |
| AP-2-UF-4500.237 (Standard 4-1/2" dia Heavy Duty Pier System) | = 105,750 lbs. |
| AP-2-PP-4500.237 (Standard 4-1/2" dia Heavy Duty Pier System) | = 84,000 lbs., |

or until lift of the structure is achieved, whichever is less.

3.3.3 Cutting Final Pier Section

It is likely that the final installed pier section will have to be removed from the hole and cut to a length suitable to provide space for installing the top pier platform. Mark and cut the pier section to the proper length using a metal cutting saw capable of a smooth cut at 90° to the length of the pier section. After cutting to length, the final pier section is replaced. Note: If modified sleeving is to be installed, the pier pipe shall be cut 1" shorter to allow clearance of the internal ring of the modified sleeve pipe.

3.3.4 Drive Equipment Removal

The drive stand assembly is then removed from the pier bracket by removing the 1" diameter locking pins.

NOTE: If a modified pier is being installed, or if the pier is to be sleeved, perform the operations in paragraph 3.4 before removing the drive stand assembly.

3.4 DRIVING of PIPE SLEEVE (Optional)

**NOTICE: Current CHANCE® Civil Construction practice is to limit the unsupported pier pipe exposure to a maximum of 2 feet at the published working loads for the standard pier systems. The soil must have a Standard Penetration Test "N" of greater than 4. The pier pipe must be sleeved for pier pipe exposures greater than 2 feet and up to 6 feet and/or through the depths where the Standard Penetration Test value "N" is 4 or less. Sleeve must extend at least 36" beyond the unsupported exposure and/or the area of weak soil.**

When the capacity of the pier is achieved, the drive stand assembly is used to push the pier sleeving over the last pier section(s). Locate the modified sleeve that contains an internal ring at one end and reserve it as the last piece of sleeve to be installed. This sleeve will likely need to be cut to ensure that the joints between the pier pipe and sleeving do not align. The joints between the pier sleeves and pier sections should be staggered a minimum of 18". Prior to driving any of the plain sleeving (without internal ring), measure the length of the final piece of pier pipe that was cut in section 3.3.3 above. Cut the modified sleeve pipe (that contains the internal ring) as follows:

a. If the final length of pier pipe is less than 24" but greater than 18" long, the full length of the modified sleeve is required. Do not cut the modified sleeve pipe
b. If the final length of pier pipe is less than 18" long, cut the length of modified sleeving to a length of 18" plus the final length of pier pipe (measuring from the end of the modified sleeve that contains the internal ring).
c. If the final length of pier pipe is more than 24" long, cut the length of modified sleeving to a length of 42" minus the final length of pier pipe (measuring from the end of the modified sleeve that contains the internal ring).

Installation of sleeve pipe shall be as follows: Install the length of sleeve pipe left over from cutting the modified sleeve followed by the required full lengths of sleeve pipe and then the modified sleeve section with the internal ring. The internal ring shall bear upon the top of the pier pipe when fully installed.

The drive stand and hydraulic cylinder assembly with the proper drive head attached to match the sleeve pipe diameter shall be used to push the modified sleeving over the pier sections. Sleeving shall extend to the depth specified by the engineer, but in no case less than the depth of the proposed cut, exposure, or thickness of weak soil plus three feet. **DO NOT exceed the manufacturer's rated operating capacity for the hydraulic cylinder during installation of sleeve pipe.** When the pipe sleeve(s) are installed, the drive stand assembly is removed from the pier bracket by removing the 1" diameter locking pins.

3.5 INSTALLING PIPE GROUT (Optional)

When the pier is installed to load bearing stratum, proof load tested and cut to the proper elevation, a flowable neat cement grout may be installed to the pier pipe. The grout will increase the moment of inertia (stiffness) and corrosion resistance of the pier. The grout shall be introduced to the bottom of the pier by means of a tube inserted into the pier pipe. As the grout is pumped into the pier pipe the grouting tube shall be raised as the elevation of the grout increases. The process shall be executed carefully so that air is not entrapped in the grout.

3.6 INSTALLATION of the TOP PIER PLATFORM

The top pier platform shall be installed over the last installed pier section. Align the vertical stabilizers of the top pier platform within the channels on the legs of the pier bracket and tap the top pier platform until it contacts the top of the final pier section. A small port is provided between the cap cylinder and the platform to verify contact.

3.7 INSTALLATION of the TWO PIECE LIFT HEAD ASSEMBLY

The two piece lift head assembly is temporarily attached to the pier bracket by aligning the holes in each piece. One inch diameter pins and clips are used to align and temporarily hold the two pieces together.

3.8 LIFTING and HOLDING

**WARNING! WHEN TRANSFERRING THE STRUCTURAL LOAD TO THE UNDERPINNING PIERS, MONITOR THE FOOTING AND STRUCTURE CLOSELY FOR CRACKS AND FOR MOVEMENT IN ANY DIRECTION. WATCH ALL PIER ASSEMBLIES AND RAMS TO BE SURE THAT THEY STAY IN PROPER POSITION AND ALIGNMENT. BEWARE OF HIGH PRESSURE HYDRAULIC OIL, DO NOT USE DAMAGED OR LEAKING HOSES AND/OR HYDRAULIC EQUIPMENT.**

**CRUSHING HAZARD: DO NOT PLACE HANDS OR OTHER PARTS OF THE BODY INTO VOIDS UNDER THE FOUNDATION THAT WERE CREATED DURING LIFTING AND RESTORATION.**

**CAUTION! The maximum height of the stack of shims should not exceed 4" to ensure full pier system load transfer capacity as stated in this manual.**

**Remove any mortar and caulk used to fill gaps created as a result of foundation movement prior to attempting to lift the structure. Failure to permit clearance for masonry movement could result in limited restoration, broken windows and/or damage to the exterior of the structure.**

The lifting and holding operation is designed to raise the structure and to restore it to as close to the original elevation as the construction will allow. Normally this lifting and holding operation is accomplished with several simultaneous pier placements. Install a 25 to 50 ton hydraulic ram as required between the two piece lift head assembly and the top pier platform on each pier. Install 3-1/2" square by 3/4" pier shims, or equivalent, to reduce excess space between the ram and the two piece lift head assembly. This increases the effective ram strokes. The rams shall be actuated simultaneously to raise the structure. Lifting shall continue until the structure is restored to its approximate original elevation or to design specifications. When restored, the lifting forces and amount of lift is documented.

Install the cadmium plated lift shims above the vertical stabilizer plates of the top pier platform. The maximum allowable height of shims that will maintain published ratings of the pier system is 4". The 7 gauge shims shall always be stacked to provide the required height. The 16 gauge shims are only used for fine adjustments between the stack of 7 gauge shims and the bottom of the pier pins or bolts. Install two high strength pier pins (3/4” dia Grade 8 Bolts AP-UF-4500.237[*] and AP-PP-4500.237[*]) into the holes in the pier bracket by tapping the high strength pier pins into place. There must be a snug fit of the high strength pier pins and the lift shims. The taper pins (3/4” dia Grade 8 bolts for AP-UF-4500.237[*] and AP-PP-4500.237[*]) shall be installed fully until the head contacts the bracket. The load shall then be transferred to the pier system by removing the pressure from the hydraulic rams. Remove the ram and then remove the 1" locking pins and the two piece lift head assembly from the pier bracket.

3.9 DOCUMENTATION

The installer shall carefully monitor the driving force applied to the pier sections as the pier is installed. It is recommended that the driving force be recorded at 3-1/2 foot intervals unless directed otherwise by the engineer. The form of the data may be as directed by the customer or the engineer.

The lifting force, lift, and pier depth shall also be recorded and presented in a tabular form. In addition, the installer shall know and have calculated the desired terminal pressure that will create the desired Proof Load Test force approved by the engineer prior to beginning the pier installation.

3.10 VOID FILLING (Optional – Depends upon soil characteristics, structure, and amount of lift)

**CAUTION!** **When filling a void under a slab on grade, it should be noted that the process introduces moisture under the slab that can cause upheaval several days after the injection work is complete. This is most likely to occur in areas with highly expansive soils and during dry periods of the year. The contractor should exercise extreme caution not to inject too much grout into void areas.**

**A performance test of the plumbing system shall be performed before, during and after the void filling operation. This will prevent injected grout from damaging plumbing lines under the slab.**

After raising operations are complete, voids created between the foundation and underlying soil shall be filled using a low pressure injection of grout slurry. Injection shall be through holes through the foundation. The contractor shall inject the grout in such a manner as to completely fill the void without trapping pockets of air. When the operation is complete, the contractor shall repair the injection holes by filling the holes with high strength non-shrinking grout and finishing to reasonably match the existing surface textures and elevations.

3.11 CLEAN UP

**CAUTION!** **Proper drainage is required! Any drainage correction and/or improvement should be in place concurrent with the foundation restoration. Failure to maintain proper drainage could lead to seasonal instability. Standing water adjacent to the structure may cause areas of upheaval.**

When all of the equipment has been removed, the area shall be backfilled using the previously excavated soil. The excavations shall be backfilled by placing no more than 8" of loose material in a lift and compacting that soil prior to placement of the next 8" lift. Sufficient lifts shall be used to restore the ground to its original elevation and density. Slope the soil contour around the perimeter of the structure for drainage away from the foundation. Dispose of all waste in a legal manner.

END OF SPECIFICATION