MODEL SPECIFICATION

ATLAS RESISTANCE® MODIFIED PIER SYSTEM with INTEGRATED CHANCE® HELICAL TIEBACK ANCHOR and REACTION PLATE

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MODEL SPECIFICATION

Atlas Resistance® Modified Pier System with Integrated Chance® Helical Tieback Anchor and Reaction Plate

Atlas Resistance® Modified Piers

- **AP-2-UF-2875.165M**
- **AP-2-UFVL-3500.165M**
- **AP-2-UFVL-4000.219**

Chance® Helical Tiebacks

- **SS125 1-1/4" RCS**
- **SS1375 1-3/8" RCS**
- **SS5 and SS150 1-1/2" RCS**
- **SS175 1-3/4" RCS**

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 the Atlas Resistance® 2-Piece Modified Pier System for structural foundation support and installation of the Chance® Helical Tieback System for lateral support of the proposed structure 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. Excavation and preparation of foundation soil to grade for pier installation with an excavation of sufficient size and depth behind the proposed footing to permit installation of the Atlas Resistance® 2-Piece Modified Pier and insertion of the Chance® Helical Lead Section, and any extension sections;

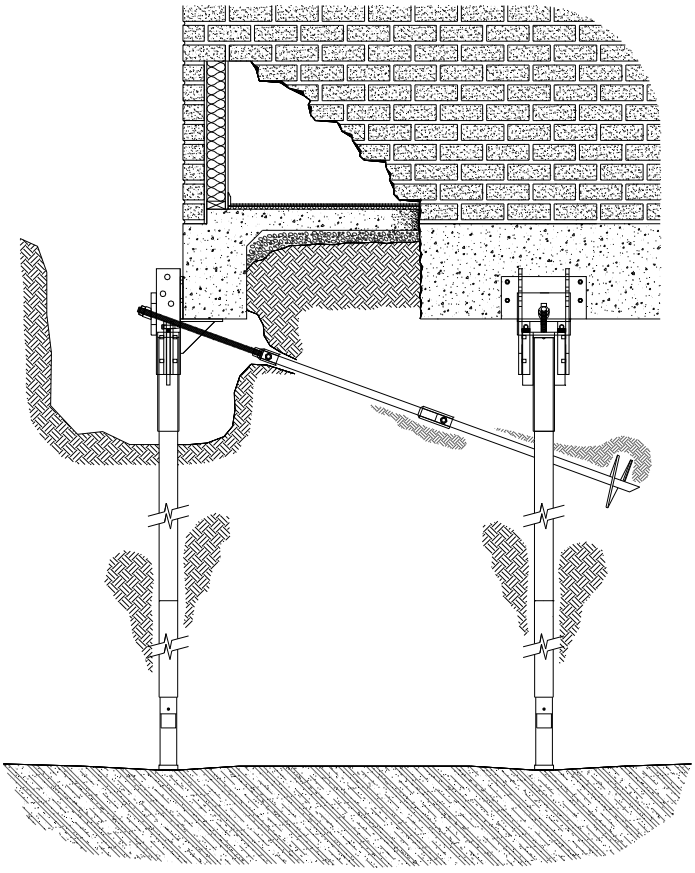
c. Mounting of the hydraulic gear motor on a backhoe unit or similar auxiliary powered equipment and the installation of the tieback anchor to the required torque resistance and installation angle to achieve adequate soil cover. Removal of the hydraulic gear motor;

d. Installation of the 2-Piece pier bracket including concrete anchors, mounting of the drive stand assembly and the installation of steel pier sections, Proof load testing the pier to designed specifications and installation of sleeving over the pier pipe to required depth;

e. Transferring the structural load to the piers with hydraulic rams to the specified working load;

f. Connecting the tieback reaction plate to the Chance® Helical Tieback Anchor, securing the tieback reaction plate to the Atlas Resistance® 2-Piece Modified Pier Bracket, conducting optional Field Load tests on one or more Chance® Helical Tieback Anchors and loading said tiebacks to working load;

g. General site clean-up.



Typical Application Using Atlas Resistance® 2-Piece Modified Piers with Integrated Chance® Helical Tieback Anchors.

1.2 REFERENCES

a. CHANCE® Civil Construction Technical Design Manual, latest version; CHANCE® Civil Construction, Hubbell Power Systems, Inc., 2006.

b. Foundation Analysis and Design, Joseph E. Bowles, 4th Edition, McGraw Hill, 1988.

c. Foundation Engineering, G.A. Leonards, Editor, McGraw Hill, 1962.

d. American Society for Testing and Materials (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 A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware.

(5) ASTM A193/A193M - Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service.

(6) ASTM A252 - Welded and Seamless Steel Pipe Piles.

(7) ASTM A325 - Standard Specification for Structural Bolts, Steel, Heated Treated, 120/105 ksi Minimum Tensile Strength.

(8) ASTM A500 - Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

(9) ASTM A513 - Standard Specification for Electric Resistance Welded Carbon and Alloy Steel Mechanical Tubing.

(10) ASTM A536 - Standard Specifications for Ductile Iron Castings.

(11) ASTM A572 - Standard Specification for High Strength Low Alloy Columbium-Vanadium Structural Steel.

(12) ASTM A615 - Standard Specification for All Thread Rebar, Grade 60.

(13) ASTM A656 - Hot-Rolled Structural Steel, High-Strength Alloy Plate with Improved Formability.

(14) ASTM A958 - Standard Specifications for Steel Casings, Carbon, and Alloy, with Tensile Requirements, Chemical Requirements Similar to Wrought Grades.

(15) ASTM A1018 - Steel, Sheet and Strip, Heavy Thickness Coils, Hot Rolled, Carbon, Structural, High-Strength Low-Alloy, Columbium or Vanadium, and High-Strength Low-Allow with Improved Formability.

e. Society of Automotive Engineers (SAE) specifications, most recent versions.

SAE J429 Mechanical and Material Requirements for Externally Threaded Fasteners.

1.3 DELIVERY, STORAGE and HANDLING

All CHANCE® Civil Construction products 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 RESISTANCE® PIER MATERIAL

2.1 PIER BRACKET

The pier bracket shall be a welded assembly of 5/8" and 1/2" thick cut steel plates conforming to ASTM A36, A568 and A569. The pier bracket shall provide a bearing surface against the bottom of the footing and the vertical face of the foundation. The pier bracket shall have an extended vertical leg that allows for securing the bracket to the footing through tabs on the sides of the pier bracket. The pier bracket shall have guides for installing the top pier platform.

2.2 ANCHOR BOLTS

Each under-footing 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.

2.3 GROUT (Optional for Pier Bracket Mounting)

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 GROUT (Optional)

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

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 and sleeving to the design depth. 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 and is mounted to the structure with at least two 1/2" diameter by 5-1/2" long (minimum) steel concrete expansion bolts.

2.5 PIER SECTION

2.5.1 AP2-2875.165 Series Pier Section

Each pier section shall be fabricated from a 2-7/8" outside diameter by 42" long mill rolled, induction heat treated steel section with a 0.165" wall thickness. The initial section shall have a 3-1/2" outside diameter 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 attached to one end and no outside collar. Steel in this section shall conform to ASTM A500 Grade B.

2.5.2 AP2-3500.165 Series Pier Section

Each pier section shall be fabricated from a 3-1/2" outside diameter 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" outside diameter 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 attached to one end and no outside collar. Steel in this section shall conform to ASTM A500 Grade B.

2.5.3 AP2-4000.219 Series Pier Section

Each pier section shall be fabricated from a 4" outside diameter by 42" long mill rolled steel section with a 0.219" wall thickness. The initial section shall have a 4-1/2" outside diameter 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 attached to one end and no outside collar. Steel in this section shall conform to ASTM A500 Grade B.

2.6 PIER COUPLING

The pier coupling shall be a 6" long tubular steel section of suitable diameter to fit inside the pier section. The coupling is mechanically 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 conform to ASTM A513 or ASTM A500 Grade B.

2.7 MODIFIED PIER SLEEVE

The sleeve is used to stiffen the segmented joints of the pier pipe. The modified sleeve pier section shall be fabricated from a 42" long mill rolled tubing, 3-1/2" diameter, 0.216" wall; 4" diameter, 0.219" wall; or 4-1/2" diameter, 0.237" wall thickness. The yield strength is 50,000 psi. The length of the modified pier sleeve that mounts last on top of the pier pipe shall have an internal ring welded to one end. This ring provides load transfer from the structure to the pier pipe. The sleeving is supplied one nominal diameter size greater than the pier pipe. The sleeving shall be installed in a manner that staggers the joints in the pier with the joints in the sleeving. Steel in this section shall conform to one or more of ASTM A53 or ASTM A500 Grade B.

2.8 TOP PIER PLATFORM

The standard pier platform is a welded assembly consisting of an 18" long steel tube of suitable size to fit over the pier section that will form the cap cylinder. The cap cylinder shall have two 10" long 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 steel plate welded to the top of the cap cylinder. All steel elements conform to ASTM A36, ASTM A500 Grade B and/or A53.

2.9 HIGH STRENGTH PIER PINS

Two 5/8" diameter by 3" long high strength, heat treated cadmium plated pier pins conforming to ASTM A29 Grade 10B21 are required per pier. The pins shall be quenched and tempered to HRC 36± and capable of providing 55,000 lbs of ultimate shear resistance capacity in double shear configuration.

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". 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 WELDMENTS

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

3 HELICAL TIEBACK MATERIAL

3.1 HYDRAULIC GEAR MOTOR

Hydraulic gear motors used to install Chance® Helical Tieback Anchors to the desired torque are generally rated between 4,500 to 12,000 ft-lb. Depending upon the soil conditions and pile configuration, different hydraulic gear motors may be used. The installation torque rating of the hydraulic gear motor shall be at least 25% higher than the planned installation torque.

3.2 HELICAL TIEBACK ANCHOR for LATERAL SUPPORT

3.2.1 Lead Section

The lead section consists of a round cornered square hot rolled steel lead section conforming to ASTM A29. The shaft may be specified in sizes from 1-1/4" to 1-3/4" square, and the length of the lead section is specified from 10" long to 10 feet long as required by the application. One end of the lead section shall have a beveled pilot point to aid in starting the anchor. The other end shall have one hole to receive an integrally forged coupling or cast sleeve, depending on the shaft size. Welded to the lead section shall be one or more Grade 50 or Grade 80 hot rolled steel helical plates with a thickness of 3/8" or 1/2" and a 3" pitch. Helical plate diameters may be specified in any combination of equal or increasing diameters from 6" to 16".

3.2.2 Extension Section

A standard extension section shall be an assembly consisting of a round cornered square hot rolled steel section conforming to ASTM A29, an integrally forged coupling or a cast steel sleeve and mounting hardware. The shaft shall be a specified size from 1-1/4" to 1-3/4" square, and the length of the extension section specified from 36" long to 10 feet long as required by the application. One end (integrally forged couplings) or each end (cast sleeve) of the shaft shall have one hole to receive coupling attachment bolts depending on the shaft size.

In higher load capacity projects or in very weak soil conditions, the standard extension section may have one or more Grade 50 and 80 hot rolled steel helical plates with the thickness specified as either 3/8" or 1/2" and a pitch of 3" welded to the shaft. Helical plate diameters may be specified in any combination of equal or increasing diameters from the largest helical plate on the lead section up to 16".

For Type SS5, SS150 and SS175 material, the coupling shall be formed as an integral part of the plain and helical extension material as hot upset forged sockets. For Type SS125 and SS1375 material, the coupling shall be a cast steel sleeve conforming to ASTM A958 Grade 90/60, with two holes for connecting shaft sections together. The sections are attached with structural grade bolts.

3.2.3 Transition

Helical tieback anchor thread bar shall be either a threaded stud adapter, or a combination of pre-stressed steel tendon and ductile iron or forged steel adapter, both of which are attached to the previously installed central steel shaft via an integrally forged socket or cast steel socket and coupling bolt. Tendon shall be a continuous thread steel bar of specified diameter and length depending on the application and load per ASTM A615 (Dywidag bar or Williams All-Thread Rebar).

3.2.4 Continuous Threaded Rebar

A continuous threaded rebar provides the attachment between the helical anchor and the tieback reaction plate. The continuous threaded rebar shall be a threaded steel bar of specified diameter and length depending on the application and loading. Each continuous threaded rebar shall be supplied with a hex nut and bevel washer for attachment. Conforms to ASTM A615, Grade 75.

3.2.5 Bevel Washer

A bevel washer shall be installed between the plate washer and the nut on the continuously threaded rebar. The bevel washer helps to transfer the load between the vertical tieback reaction plate and angle of the anchor. The standard 15º bevel washer shall be 2" square steel, hot dip galvanized, with a 1-1/8" diameter mounting hole in the center to accept threaded bar.

3.2.6 Tieback Reaction Plate

A tieback reaction plate is installed between the pier bracket and the nut and bevel washer on the end of the threaded bar. The tieback reaction plate shall be fabricated of 3/4" thick steel plate conforming to ASTM A572, with a mounting hole in the center to accept the threaded bar.

4 EXECUTION

The following is intended to provide the controlling specification for the major steps undertaken in the installation of the Atlas Resistance® Pier System with Tieback Anchor for lateral support.

WARNING! THOROUGHLY INVESTIGATE THE 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.

4.1 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 30". The excavation shall continue at least 15" vertically beneath the bottom of the concrete and 12" under the stem wall at proposed location of the pier bracket. A chipping hammer shall be used to smooth and prepare the foundation for later mounting of the pier bracket. The vertical and bottom face of the footing, if applicable, shall, to the extent possible, be smooth and at right angles to each other. The spread footing, if present, shall be notched to allow the AP-2 Series Pier Bracket to mount directly under the bearing load of the stem wall unless directed otherwise by the engineer. DO NOT cut any reinforcing steel in the footing element without approval by 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.

CAUTION! Carefully space the placements 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.

4.2 INSTALLATION of the TIEBACK ANCHOR

The hydraulic gear motor shall be installed on a backhoe or other suitable pier installation unit. The lead section is positioned in the excavation with the smallest helical plate nearest the soil. The opposite end is attached to the hydraulic gear motor drive head with the appropriate drive tools, bent arm pin(s) and retaining clip(s). The lead section is usually aligned perpendicular to the plane of the footing and installed at the specified angle down from horizontal, normally 5º to 20º. The engineer shall specify installation angles.

WARNING! UNDER NO CIRCUMSTANCES SHOULD THESE PRODUCTS AND EQUIPMENT BE USED WITHOUT PROPER TRAINING IN PROCEDURE AND KNOWLEDGE OF PRODUCT CAPACITIES. THE USE AND OPERATION OF HYDRAULIC GEAR MOTORS CAN BE EXTREMELY HAZARDOUS WITHOUT PROPER TRAINING OF FIELD PERSONNEL. THE TORSIONAL FORCES DEVELOPED DURING INSTALLATION CAN BE EXTREME, RESULTING IN POSSIBLE BREAKAGE OF MATERIALS AND EQUIPMENT. RAPID TRANSFER OF THESE FORCES TO REACTION ASSEMBLIES CAN OCCUR, LEAVING NO TIME FOR PERSONNEL TO AVOID CONTACT. SERIOUS BODILY INJURY, PROPERTY DAMAGE AND POTENTIALLY LIFE THREATENING SITUATIONS CAN ARISE FROM IMPROPER USE OF EQUIPMENT AND MATERIALS USED IN THE INSTALLATION OF THESE PRODUCTS.

IF A REACTION BAR IS USED, IT MUST BE MECHANICALLY FASTENED TO A SUITABLE RESTRAINT AGAINST ROTATIONAL MOVEMENTS IN BOTH DIRECTIONS. SERIOUS INJURY AND PROPERTY DAMAGE MAY OCCUR IF AN UNMOVABLE OBJECT DOES NOT PROPERLY RESTRAIN THE REACTION BAR IN ALL DIRECTIONS.

WARNING! **DO NOT STAND ON THE REACTION BAR OR USE ANY BODY PARTS TO ATTEMPT TO RESTRAIN THE REACTION BAR. SERIOUS INJURY AND PROPERTY DAMAGE MAY OCCUR IF THE REACTION BAR IS NOT PROPERLY ATTACHED TO THE STRUCTURE OR OTHERWISE RESTRAINED BY A SUITABLE UNMOVABLE OBJECT.**

Additional extension sections are then installed as required until the specified design installation torque or adequate tieback resistance is achieved at the desired depth. Driving shall cease when the final design torque is obtained through the specified distance. The anchor shall be driven at the design torque until the driven end of the anchor is at the proper design location to attach to the tieback reaction plate. In dense soils, a long extension section may have to be removed and a shorter one installed to achieve the proper final location. The hydraulic gear motor assembly is removed after termination criteria is achieved. The installer must be mindful that the shaft of the tieback must be positioned to later connect to the underpinning pier bracket.

4.3 DOCUMENTATION

The installer shall carefully monitor the torque applied to the helical tieback anchor as it is installed. It is recommended that the installation torque be recorded at one foot intervals. In no case should the measurements exceed every two feet unless directed otherwise by the engineer. Torque may be monitored with in-line torque monitoring equipment, or with a hydraulic pressure gage that has been calibrated to the torque motor, or with equipment that measures the differential pressure across the torque motor. If using hydraulic pressure to measure torque, the installer shall provide calibration data relating hydraulic pressure to torque for the selected torque motor. At the specified intervals, the installer shall record the torque in the installation log for each helical anchor.

At the conclusion of the installation, the raw field data shall be converted to a Tieback Anchor Installation Summary. A copy of the raw field data and the Tieback Anchor Installation Summary shall be provided to the engineer for review.

4.4 INSTALLATION of the 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 aligned plumb prior to driving each pier section. A carpenter's level may be used to verify the vertical alignment in both plains. The bubble shall be between the lines on the vial. It is acceptable for the bubble to touch a line.

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.

4.5 DRIVING and TESTING PIER SECTIONS

WARNING! **THE DRIVE STAND AND DRIVE CYLINDER ARE VERY HEAVY. USE PROPER LIFTING AND HANDLING TECHNIQUES. STAY 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.**

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

4.5.1 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.

CAUTION! 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-2875.165M (Modified 2-7/8" Dia Pier System)	= 57,750 lbs
AP-2-UFVL-3500.165M (Modified 3-1/2" Dia Pier Systems)	= 75,075 lbs
AP-2-UFVL-4000.219 (4" Dia Pier Systems)	= 90,750 lbs

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

4.5.2 Proof Load Testing (Optional)

To accomplish field load testing of the Atlas Resistance® Pier, CHANCE® Civil Construction recommends a 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 by 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-2875.165M (Modified 2-7/8" Dia Pier System)	= 52,500 lbs
AP-2-UFVL-3500.165M (Modified 3-1/2" Dia Pier Systems)	= 68,250 lbs
AP-2-UFVL-4000.219 (4" Dia Pier Systems)	= 82,500 lbs

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

4.5.3 Cutting Final Pier Section

It is likely that the final installed pier section will have to be cut to a length suitable to provide space for installing the top pier platform. Mark the last section of pier pipe at the proper elevation, remove the pier section from the hole 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 and the top of pier elevation checked.

4.5.4 Modified Pier Sleeve

The modified pier sleeve is used to stiffen the pier pipe near the pier bracket. The modified pier sleeve that mounts on top of the pier pipe shall have an internal ring welded to one end. This ring provides load transfer from the structure to the pier pipe. The sleeve supplied with the modified pier system consists of one sleeve pipe with a nominal diameter size greater than the pier pipe. Once the capacity of the pier is achieved and the pier pipe cut to final length, the drive stand assembly is used to push the pipe sleeve over the last pier section or sections. **DO NOT exceed the manufacturer's rated operating capacity for the hydraulic cylinder.**

4.5.5 Drive Equipment Removal

The hydraulic drive cylinder is removed from the drive stand assembly. The drive stand assembly is then removed from the pier bracket by removing the locking pins at the pier bracket and by removing the nuts securing the drive stand assembly to the stem wall. After removing the drive stand assembly, cut off or drive the anchor bolts into the wall.

4.6 INSTALLING FLOWABLE GROUT (Optional)

The engineer may require additional stiffness of the pier pipe. Usually, specifications for grouting the pier include the installation of a #4 steel reinforcing bar prior to introducing the grout. When the pier is installed to load bearing stratum and cut to the proper elevation, a neat cement flowable grout may be installed into 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 tremie tube inserted into the pier pipe. As the grout is pumped into the pier pipe the tube shall be removed as the elevation of the grout increases. The process shall be executed carefully so that air is not retained into the grout.

4.7 INSTALLATION of the TOP PIER PLATFORM

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

4.8 LOAD TRANSFER

The load transfer operation is designed to transfer the structural support from the soil to the underpinning pier. Install the 55-ton hydraulic ram as required between the pier lift head assembly and the top pier platform of the pier. Apply the specified design load to the pier by pressurizing the hydraulic ram. Install the cadmium plated lift shims above the vertical stabilizer plates of the top pier platform. (**Note**: The 7 gauge shims shall be used for filling the space. The 16 gauge shims are only used for fine adjustments between the stack of shims and the bottom of the pier pin holes in the pier bracket.) Install two high strength pier pins 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 design load is then transferred to the Atlas Resistance® Pier system by removing the pressure from the hydraulic ram. Remove the ram along with the lift head assembly from the pier bracket.

4.9 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 be provided with the working load and the desired Factor of Safety approved by the engineer prior to beginning the pier installation.

4.10 LOADING the TIEBACK ANCHOR

The transition is bolted to the final tieback extension section using the hardware supplied with the transition. Then a length of continuously threaded bar is attached to the transition and extended between the vertical legs of the pier bracket and above the top pier platform. The tieback reaction plate, bevel washer and hex lag nut are installed on to the threaded bar. Normally, the longest side of the tieback reaction plate is positioned in the horizontal direction and transfers force to the vertical legs of the 2-piece Atlas Resistance® Pier bracket.

4.1.1 Hydraulically Loading the Tieback Anchor

A twin cylinder hydraulic ram or hollow-ram hydraulic cylinder and a field fabricated loading frame are positioned over the threaded bar, secured with an additional hex lag nut and connected to the pump. The hydraulic ram may bear against the tieback reaction plate. The hydraulic system is activated causing a lateral force against the pier bracket. The supervising engineer shall determine the preload force. Care should be exercised by accomplishing the loading at a slow pace while visually monitoring the pier bracket and foundation for any evidence of new structural distress.

WARNING! DO NOT ALLOW ANYONE TO STAND IN THE AREA BEHIND THE THREADED BAR AND JACK DURING LOADING. SERIOUS INJURY MAY OCCUR IF A COMPONENT SHOULD FAIL DURING OPERATION.

The tieback may be load tested for anchoring (tension) capacity. It is recommended that a Factor of Safety above the design load be achieved. Refer to *Appendix B* in the CHANCE® Civil Construction Technical Design Manual, Latest Edition, for details on performing a load test on tieback anchors.

LOAD TESTING SHOULD BE CONDUCTED UNDER THE SUPERVISION OF THE RESPONSIBLE ENGINEER

The final step in the installation of the tieback anchor is to lock the tieback reaction plate against the 2-piece Atlas Resistance® Pier bracket using the bevel washer and hex nut. Check the nut for snugness before releasing hydraulic pressure on the hydraulic ram. Remove the hydraulic ram. Cut and remove any excessive length of threaded bar.

4.1.2 Mechanically Loading the Tieback Anchor (Alternate Procedure)

The tieback anchor may also be loaded using a torque wrench. This method does not provide the accurate anchor load data obtained in section 4.1.1. In addition, the maximum load that can practically be applied is in the range of 10,000 to 12,000 pounds.

The nut on the threaded bar is actuated with a torque wrench to apply the desired force on the tieback anchor. A Torque vs Load graph is presented in the CHANCE® Civil Construction Technical Design Manual as a guide for estimating the force applied to the pier bracket based upon the torque measured at the nut. After the tieback anchor is loaded as specified by the engineer, cut and remove any excessive length of threaded bar.

4.11 CLEAN UP

When the installation is complete, tested, loaded and locked in place all equipment shall to be removed from the site. All debris shall be removed and disposed of in a legal manner.

END OF SPECIFICATION