

TYPICAL SPECIFICATION

ECP Steel Pier™ PPB 350 Utility Bracket System, TA-150 Torque Anchor™ Tieback and PPB 350-TA Tieback Adapter Assembly

Section 1- General

1.01 Typical Installation Scope

Furnish labor, equipment, tools and material to install Model 350 Utility Bracket, Steel Pier to end bearing and TA-150 Helical Tieback Anchor 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. Excavate as required for installation of the products.
4. Prepare stem wall, footing and/or grade beam of the foundation for pier bracket mounting.
5. Install Helical Torque Anchor™ Tieback under the footing
6. Install ECP Steel Pier™ bracket and drive stand unit.
7. Securely anchor the drive stand and pier bracket to the structure.
8. Install the drive cylinder and connect hydraulics.
9. Hydraulically drive the steel pier sections to the required installation force.
10. Cut final pier section to length and install Model 350-TA Pier Extension Assembly
11. Install all-thread bar from Tieback transition through Pier Extension Assembly, install Bearing Plate over threaded bar and secure to Pier Bracket using Face Plate nuts, and install Bevel Washer and Nut.
12. Install lift assemblies and hydraulic lift cylinders to utility brackets then connect hydraulics.
13. Transfer the load to the piers, lift the structure to designed specifications and mechanically secure system to maintain elevation.
14. Tension Tieback Anchor to specifications
15. Remove equipment from work area.
16. Backfill and 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 Torque Anchors

The 1-1/2" round corner solid square bars shall conform to ASTM A29. Yield strength of the bars shall be 90,000 psi. The shaft shall have a torque limit of 7,000 ft-lb

2.011 Leads

Each lead section shall have a 45-degree bevel to aid in starting the helical torque anchor™. The other end shall have one hole to attach an Extension Section or Transition. Leads may be 10", 5', 7', or 10' long depending upon the application. Welded to the lead shall be one or more ASTM A572 Grade 50 round steel plates with a 3/8" thickness and a 3-inch helical pitch. Helical plate diameter shall be specified in any combination of equal or increasing diameters from 6 inches to 14 inches, in 2-inch increments.

2.012 Hot Forged Extensions

Extensions shall have a hot forged integral coupling feature. The Extension may be specified as 1-1/2', 3', 5', 7' or 10' long as required by the application. Both ends of the Extension Section shall have one bolt hole. The lower end of the extension shall have an expanded hot forged female receiver that will fit over the shaft of a previously installed extension or lead. The hole at the other end is for attachment to another section of tieback anchor shaft extension or to a transition to all-thread bar. The hot forged extension shall be supplied with attachment hardware.

In higher load capacity projects or in very weak soil conditions, the hot forged extension may have one or more ASTM A572 Grade 50 round helical steel plates as specified in section 2.011.

2.013 Transition

The transition is a component that attaches to the terminal end of the helical tieback shaft and the other end has a threaded socket to accept a continuously threaded bar. The square shaft shall have hot forged integral coupling feature. The forged end of the transition shall have one bolt hole for attachment to the final section of torque anchor shaft. The opposite end of the transition shall have a threaded hole that will accept a continuously threaded shaft. The thread shall be sized to accept Williams Form WF-8 bar.

2.014 Attachment Hardware

Each extension and transition shall be supplied with one 3/4" diameter, appropriate length SAE J429 Grade 8 bolt and nut having a minimum ultimate tensile strength of 150,000 psi and a minimum yield of 130,000 psi.

2.015 Continuous Threaded Bar and Nut

Connection between the tieback anchor and the pier bracket shall be accomplished by an all-thread bar of suitable length. The bar shall have a nominal thread size of 1" diameter with an approximate major thread diameter of 1-1/8". Minimum ultimate strength shall be 79,000 pounds. Bar shall be supplied with a hex nut. (Williams R61-08 & R63-08 or equal)

2.02 Tieback Bearing Plate

The bearing plate is designed to transfer the load of the helical tieback anchor to the pier bracket. The bearing plate shall be fabricated from 1/2" x 5" x 7-1/4" hot rolled steel plate. The plate shall have slots suitable to accept the all-thread bar from the tieback transition and the bracket mounting studs.

2.03 Bevel Washer

A bevel washer having an outside diameter of 2-1/2" and an inside diameter of 1-1/4" with a 20° (+0°/-5°) bevel is used to transfer the tension load from the tieback anchor to the bearing plate. The bevel washer shall be 2" thick.

2.04 Pier Sections

Each pier section shall be manufactured from steel tubing having a nominal outside diameter of 3-1/2" outside diameter and a wall thickness of 0.165". 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 be approximately 42" long and 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.

2.041 Lead Section

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 4" outside diameter by 0.220" 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.

2.042 Extension Section

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 3-1/8" 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" button welds.

2.043 Tieback Pier Extension Assembly

The extension section assembly shall have a coupling installed as described in 2.042 installed on one end of a 22" long section of pier pipe. Attached over the pier pipe shall be a sleeve consisting of a 10-1/2" long piece of 4" diameter by 0.220" wall thickness tubing. Through the both the pier pipe and sleeve shall be a slot to accept the all-thread bar from the tieback. This slot shall be 1-3/16" wide by 8-1/2" long. (ECP Model 350-TA Pier Extension Assembly)

2.044 External Pier Sleeve (Optional)

The external pier sleeve shall be manufactured from steel tubing having a nominal outside diameter of 4" outside diameter and a wall thickness of 0.220". The external pier sleeve sections shall be fabricated from mill rolled, induction heat treated steel with a minimum yield strength of 55,000 psi. Each external pier sleeve section shall be approximately 42" long and have mill finish.

2.045 Inertia Sleeve (Optional)

The inertia sleeve is a pipe assembly that fits inside the pier pipe during installation to increase the moment of inertia of the pier pipe and strengthens the joints between pier sections. The inertia sleeve may be installed inside the pier pipe through areas of weak soil, areas of unsupported length of pier pipe or where additional pier wall strength is required. The inertia sleeve shall be fabricated from steel tube having a 3-1/8" outside diameter by 0.180" wall and 35-1/4" long. The coupling shall be fabricated from 2-5/8" diameter by 0.188" wall steel tubing that is 12 inches long. Three inches of the coupling shall be inserted into the inertia sleeve section and secured by two 1/2" button welds.

2.05 Pier Bracket

The pier bracket shall be designed to connect the structure to the pier and to transfer the load of the structure to the pier pipe. The pier bracket shall be a welded assembly new, clean steel with a thickness of 1/2" or 5/8" and structural square tubing with a thickness of 1/4" that conforms to ASTM A-36.

The pier bracket shall have a 74 square inch horizontal bearing surface that contacts the bottom of the concrete foundation and a vertical mounting plate area of 91 square inches. The 1/2" thick vertical mounting plate shall have four 11/16" diameter holes that will accept 1/2" diameter concrete anchor bolts. The horizontal and vertical bearing plates shall be welded to side pieces, which measure 4" wide, by 18" long.

The following weldments and components attach to the bracket. A 9-7/8" long piece of 1-1/2" square tube with a wall thickness of 1/4" shall be welded vertically to the outer side of each side piece. Four mounting studs shall be welded to the outer front edge of the side pieces. These studs shall be fabricated from 2-1/4" long pieces of 1/2"-13 all-thread bar. Each stud shall be supplied with a 1/2"-13 hex nut. A control sleeve is required to maintain alignment of the 3-1/2" pier pipe within the drive stand during pier pipe installation. A control sleeve shall be fabricated from 11-7/8" long piece of 4" square tubing with a wall thickness of 0.188". Welded to the control sleeve shall be a 3/4" x 3/4" x 3/4" piece of steel that forms a stop. Supplied with the bracket shall be two face plates that are used to secure the pier pipe and control sleeve in proper alignment and position within the pier bracket. The face plates shall be 2" by 7-1/4" and contain two 9/16" slots to secure the face plates to the pier bracket.

2.06 Pier Cap

The pier cap is a welded assembly that connects the pier pipe to the pier bracket and transfers the structural load to the pier pipe. The pier cap shall be fabricated from 1-1/2" by 4" by 9" long steel conforming to ASTM A-36. Attached to the center of this plate shall be a piece of tubing with a suitable diameter to fit over the pier pipe and shall be cut 1" long. This ring is used to maintain pier pipe alignment. The pier cap shall have two 1" diameter holes for attaching the pier cap to the pier bracket.

2.07 Bracket Rods and Hex Nuts

Supplied with the pier bracket shall be two 7/8" – 9 all thread bars that measure 18" long and four 7/8" – 9 diameter heavy hex nuts conforming to ASTM A-193 Grade B7. The bracket 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.

2.08 Lift Assembly

The lift assembly shall consist of a lift head, two lift legs and two heavy hex nuts. The lift assembly is used to recover lost elevation and to allow for transfer of the structural load from the pier pipe to the pier bracket assembly. The lift legs are used as extensions to the bracket lift rods and allow attachment for the lift head above the pier cap. A hydraulic ram shall be installed between the lift head and pier cap during structural load transfer and recovery of lost elevations

2.081 Lift Head

The lift head shall be fabricated from 1-1/2" by 4" by 9" long steel conforming to ASTM A-36. The lift head shall have two 1" diameter holes to accept the holding/lift rods.

2.082 Lift Leg & Hex Nut

Supplied with the lift head shall be two lift leg assemblies constructed from 7/8" – 9 all thread rod that measure nominally 9" long conforming to ASTM A-193 Grade B7. One end of the all thread bar shall be threaded into a 2-1/2" long thread bar coupler to a depth of 1" and welded in place. Also supplied with each lift leg shall be a 7/8" – 9, heavy hex nut. Total length of the lift leg shall be 10-1/2".

2.09 Anchor Bolts

2.091 HUS-EZ Screw Anchor

The screw anchors are comprised of a body with a hex washer head. The nominal diameter shall be 1/2 inch and the length shall be 6 inches conforming to ICC-ESR Evaluation Report ESR-2369. The anchor shall be manufactured of heat treated carbon steel with an 8 µm thick zinc coating. (Hilti Kwik HUS-EZ 1/2" x 6" #00418077)

2.092 Expansion Anchor

The expansion anchor shall be wedge type with a single piece three section wedge conforming to Federal Specification A-A 1923-A, Type 4 and ICC-ES Evaluation Report ESR-1385. Anchor shall be zinc plated conforming to ASTM B633. Anchor bolt size: 1/2" diameter by 7" long and shall be supplied with a flat washer and hex nut. (Hilti Kwik Bolt III #282529 or equal.; or as specified by the engineer.)

2.10 Weldments

All welded connections shall conform to the requirements of the American Welding Society, "Structural Welding Code AWS.01.1" and applicable revisions.

2.11 Corrosion Protection

ECP Torque Anchors™ shall be supplied with hot dipped zinc galvanized corrosion protection per ASTM A123 Grade 75 or Grade 100 and applicable revisions.

Section 3 – Tools and Equipment

3.01 Rotary Hydraulic Torque Motor

A hydraulic gear motor is required to install the helical torque anchor™ to the desired torque and depth. The capacity of the gear motor generally will range between 4,000 to 8,000 foot-pounds, depending upon the soil conditions and shall be fully

reversible. The installation torque rating of the hydraulic gear motor shall be at least 25 percent higher than the planned installation torque. Rotation shall range between 5 and 20 revolutions per minute.

3.02 Torque Monitoring Device

The installation torque applied to the helical torque anchor™ shall be monitored continuously during installation. The torque monitoring device may be a part of the installing unit or may be a device in line with the hydraulics. Accuracy of the torque monitoring device shall be insured by having calibration data available for review by the engineer or the owner's representative.

3.03 Hydraulic Pumps

3.031 Pier Installation Pump

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 in³/min up to 2,000 psi and a rate of 100 in³/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 Tieback Installation Pump

A source of hydraulic pressure or a hydraulic pump is required to operate the rotary torque motor used to advance the helical tieback into the soil. The hydraulic requirements are dictated by the specific installation motor used but typically range from 2,400 to 3,000 psi of hydraulic pressure and a flow rate of 10 to 40 gallons per minute. The pump shall have the ability to control and reverse the flow of hydraulic oil. Many pieces of construction equipment such as excavators, backhoes, and skid steer machines can be adapted to mount the rotary torque motor, and meet the hydraulic pressure and flow requirements of the rotary torque motor. It is also possible to use a portable hydraulic pump, portable rotary torque motor and torque reaction bar for the installation.

3.033 Hand Pump

One or more hand pumps may be required to transfer structural load, to recover lost elevation, and to tension the tieback anchors. The hand pump(s) are connected to hydraulic lifting rams via a manifold arrangement to provide uniform force to several pier placements at the same time, or to the hollow plunger cylinder. 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 in³ per stroke and above 400 psi, 0.15 in³. (Enerpac P801 or equal)

3.04 Tooling

The hydraulic torque motor must be firmly mounted to machinery capable of positioning the torque anchor at the proper angle and capable of providing proper installation force (crowd) to advance the torque anchor. Adapters used to connect the motor to the helical torque anchor™ shall have a capacity exceeding the torque required to install the anchor and shall be mechanically connected to the anchor during installation.

3.05 Drive Stand

The proprietary drive stand is a welded assembly designed to maintain vertical alignment of the pier bracket, drive cylinder and pier pipe during pier installation. The drive stand shall be a welded assembly of 1/2", 5/8" and 1" thick cold rolled flat bar stock conforming to ASTM A-36 and 3/8" and 1/2" thick hot rolled steel conforming to ASTM A-29. Supplied with the drive stand shall be three face plates and six hex nuts. The face plates shall be installed to enhance the integrity and safety of the drive stand under full load and provides pier pipe support. The upper face plate retains the drive cylinder and has two 9/16" mounting holes. The lower face plates retain and guide the pier pipe and have two 9/16" slots for attachment to the drive stand. Two tapered drive stand pins are required to attach the drive stand to the pier bracket. These pins shall be formed from 15/16" diameter steel bar and shall be 15-1/2" long.

3.06 Drive Cylinder Assembly

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 3-1/2" diameter by 0.165 wall thickness pier pipe. The drive cylinder shall have a 3-1/4" diameter bore and 2" diameter cylinder rod. The stroke shall be 24". Working pressure may vary from 3,000 to 10,000 depending upon the cylinder manufacturer.

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

3.07 Single Acting Hydraulic Cylinders

3.071 Single Acting Hydraulic Cylinder

A single acting hydraulic cylinder shall be positioned at each pier bracket 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 in² and a stroke of 4". (Enerpac RC-254 or equal)

3.072 Single Acting Hollow Plunger Hydraulic Cylinder

A single acting hydraulic cylinder shall be used during the load transfer phase to the helical tieback, or when performing

a proof tension load test. The hydraulic cylinder shall be rated at 10,000 psi of hydraulic pressure and have heavy duty return spring. The capacity and stroke of the cylinder shall be determined by the application. (Enerpac RCH-202, RCH-302 or equal)

3.08 Pressure Gauges

3.081 Drive Cylinder Pressure Gauge

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)

3.082 Hand Pump Pressure Gauge

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 – Helical Torque Anchor™ Installation

The following specification contains the major steps to be undertaken to install helical torque anchors™. Variations may occur depending upon the application and the type of structural support required.



Warnings:

- Utilities:** Thoroughly investigate the job site for the possible existence and location of all underground utilities before proceeding. Avoid all contact with ALL underground utilities!
- Excavations:** Collapsing soil can be dangerous. Follow OSHA requirements at all times. Do not enter any excavation if there are any questions about the stability of the soil.
- Pier Placement:** Excessive distance between pier placements can damage the concrete foundation from structural overload. Verify that the foundation has sufficient structural integrity to carry the load between placements.
- Hazardous Machinery:** The use and operation of hydraulic gear motors can be very hazardous due to the power of the motor. The torsional forces developed during operation can be extreme resulting in breakage of product and equipment. The transfer of these forces may be extremely quick leaving little or no time for personnel to react and/or avoid contact. Under no circumstances should the equipment be operated without proper training in procedures and knowledge of product capabilities. Do not allow observers close to the equipment during operation.
- Reaction Bar:** An unmovable object must be used when restraining a reaction bar. The reaction bar must be firmly secured against movements in all directions. Never stand close to or on a reaction bar during installation.
- 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.



Warning!

FAILURE TO HEED THESE WARNINGS, OR TO FOLLOW SAFE WORK HABITS, OR IMPROPER USE OF THE EQUIPMENT AND MATERIALS MAY RESULT IN LIFE THREATENING SITUATIONS, BODILY INJURY AND/OR PROPERTY DAMAGE!

4.01 Excavating to Expose Footing or Grade Beam

An excavation shall be prepared adjacent to the foundation to expose the stem wall and footing or the bottom of the grade beam. The excavation shall be to a depth of 14 inches below the bottom of the foundation and 12”, minimum, beneath it. The excavated work area must be wide enough for safe working conditions, typically an excavation is 3 to 4 feet wide by 3 to 4 feet away from the structure is usually adequate at the footing, taper or shore deep excavations per OSHA guidelines. Move the excavated soil away from the work area by a distance of at least two feet and store the soil in such a manner that the soil will not erode or cause damage to the owner’s property.

4.02 Footing or Grade Beam Preparation

If the structure has a spread footing foundation, the toe of the footing shall be notched by removing the extended edge of the footing back to the stem wall for a distance along the footing of at least 18 inches in the area of the pier and tieback placement. To accomplish this pneumatic or electrical chipping hammer with a chipping bit and then a bushing tool for smoothing the

face shall be used. When preparing either a notched footing or a grade beam, the bottom area of concrete that will bear upon the pier bracket must be prepared to a smooth and level condition. Prior to acceptance of the preparation, a level shall be used to verify that the portion of the footing upon which the bracket will bear is level both perpendicular to the foundation and parallel to the structure.

IMPORTANT: If any reinforcing bar becomes exposed during these operations, consult with an Engineer before removing or cutting any steel reinforcing.

4.03 Torque Anchor™ Installation

The rotary hydraulic torque motor shall be attached to suitable portable installation equipment or to a suitable machine capable providing the proper installation angle, reaction against installation torque, and advancing force (crowd). The helical tieback lead sections shall be placed at a location indicated on the plans. The opposite end of the tieback shaft shall be attached to the rotary hydraulic torque motor and retained with a pin and retaining clip. If using portable equipment, the torque reaction bar MUST be properly secured against movements in all directions.

The lead section shall be situated under the footing at the location of the proposed centerline of the pier bracket. The tieback lead section shall be driven at a downward angle of between 15° and 20° unless directed by the engineer otherwise. The shaft shall be as near to the bottom of the footing as possible at the face of the stem wall. The tieback shall be advanced into the soil in a smooth and continuous manner using sufficient pressure for uniform advancement. The installer shall have knowledge of the desired shaft torsion requirement that will produce the desired ultimate capacity prior to beginning the installation.

Once the lead is installed, the motor shall be disconnected from the lead. One or more extensions as required to reach the specified length shall be bolted to the previously installed shaft. The hot forged coupling on the 1-1/2" solid square shaft shall be placed over the end of the previous section of torque anchor™ shaft and secured with the high strength bolt and nut supplied by the manufacturer.

The tieback anchor shall be advanced into the soil until the average design installation torsion at the required depth is achieved. Once the design torque at the design depth has been achieved, the installation motor shall be removed from the tieback shaft.

4.04 Installation Requirements

4.041 The minimum average installation shaft torsion, the minimum shaft length and depth below grade as shown on the plans shall be satisfied prior to termination the installation. The required installation torsion shall be an average of the installation torques recorded during a minimum of the last three and one-half feet of installation.

4.042 The torsional strength rating of the torque anchor™ shall not be exceeded during installation. If the torsional strength rating of the torque anchor™ has been reached, but the anchor has not reached the target depth, do the following:

4.0421 If the torsional strength rating is achieved prior to reaching the target length, the installation may be acceptable if reviewed and approved by the engineer and/or owner.

4.0422 The installer may remove the torque anchor™ and install a new one with fewer and/or smaller diameter helical plates to the design torsion, design depth and design shaft length with the review and approval by the engineer and/or owner

4.043 If the target is achieved, but the torsional requirement has not been met; the installer may do one of the following subject to the review and approval of the engineer and/or owner:

4.0431 Install the torque anchor™ deeper to obtain the required installation torsion.

4.0432 The installer may remove the torque anchor™ and install a new one with an additional helical plate and/or larger diameter helical plates.

4.0433 Reduce the load capacity of the placement and provide additional helical torque anchors™ and Model 350 Steel Pier™ systems to achieve the required total support for the project.

4.044 If the torque anchor™ hits an obstruction or is deflected from its intended path, the installation shall be terminated and the anchor removed. Either the obstruction must be removed or the torque anchor™ relocated as directed by the engineer and/or owner.

4.045 In no case shall a torque anchor™ be backed out and reinstalled to the same depth. If an anchor must be removed for any reason, it must be installed a minimum of three feet farther.

4.05 Torque Anchor™ Length Adjustment

After meeting the installation requirements, the installer may remove the final plain extension section and replace it with a shorter one that will provide a suitable termination point behind the pier bracket. The installer may advance the tieback, provided that the shaft has adequate torsional capacity, until the tieback shaft termination point under the footing is reached.

4.06 Transition Installation

The transition shall be bolted to the end of the tieback shaft using the hardware supplied by the manufacturer. The threaded

socket for the all-thread rod shall be facing outward to allow for attachment to the pier bracket once the bracket is installed to the foundation and the pier pipe driven to suitable bearing.

4.07 Documentation

The installer shall carefully monitor the torsion applied to the anchor as it is installed. It is recommended that the installation torque be recorded at one foot intervals, but should never exceed recording every two feet. The data may be collected from electronic torsion monitoring equipment that has been calibrated to the installation motor being used. Although not as accurate, the installation torque may also be monitored by noting the differential pressure across the installation motor and determining the torque from the manufacturer's published torque curves.

At the conclusion of the installation, the raw field data shall be converted into an installation report that includes the location of each placement, the installed length, and the averaged installation torsion over the final three feet, and the pre-load or working load placed on each placement.

Section 5 - Steel Pier Installation

The following specification contains the major steps to be undertaken to install the steel pier bracket, drive the pier pipe and transfer the structural loads to the pier pipe and the tieback. Variations may occur depending upon the application and the type of structural support required.



Warning!

- Pier Placement:** Thoroughly investigate the exterior of the structure adjacent to the proposed placement especially directly above the drive stand and drive cylinder. Movements of tools and equipment during pier installation may damage electrical boxes, faucets, windowsills, sliding doors and other architectural elements.
- 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 extensions 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!

5.01 Pier Bracket Installation

Place the steel installation base, or other suitable material, in the bottom of the excavation at the approximate point of the pier installation. Connect the lift assembly and pier cap to the pier bracket. Obtain a short piece of pier pipe, approximately 22" to 24" long depending upon the excavation, and place it in the pier bracket. Install the control sleeve over the pier pipe and face plates to the pier bracket by dropping the plates over the studs on either side of the pier bracket.

Maneuver the pier bracket into place under the footing with the centerline of the bracket in line with the tieback shaft; place the lower end of the piece of pier pipe into the centering ring of the installation base at the bottom of the excavation. Place a hydraulic ram between the lift assembly and the pier cap. Activate the hydraulic ram with a hand pump to bring the bearing plate of the pier bracket in contact with the previously prepared area at the bottom of the footing or grade beam.

If careful inspection reveals that the pier bracket is not plumb (vertical) and evenly bearing across all of the bottom of the footing and against the vertical face of the foundation, then the assembly must be removed and further preparation work must be performed. If only minor correction is required, lower the bracket about two inches and place quick setting, high strength grout on the bearing plate and realign the pier bracket.

Carefully check for alignment and proper bearing between the pier bracket and the bottom of the footing, plus verify proper contact between the pier bracket and the vertical face of the foundation. Activate the cylinder to achieve even bearing between the pier bracket and the footing.

Bolt Bracket to the foundation element. The procedure depends upon type of anchor bolt used. **Use no more than one bolt on each side of the mounting plate:**

- Drill no more than two 1/2" x 6", minimum, deep holes to accept the Hilti Kwik HUS-EZ 1/2" x 6" Screw Anchor Bolts. Clean drilled hole with compressed air to remove all concrete powder. Tighten bolts to a measured torque of 45 ft-lbs using a calibrated torque wrench.
- Drill and install two 1/2" x 7" long concrete expansion anchors, flat washers and hex nuts. Tighten to securely fasten the bracket in position.

After the grout sets continue with the installation. Remove the lift assembly and hydraulic ram from the pier bracket. Lower the drive stand into the excavated area then slide the drive stand horizontally over the two pieces of 1-1/2" square tubing on the pier bracket. The 15/16" diameter tapered drive stand pins shall be installed through the holes in the drive stand that are directly above and aligned with the two 1-1/2" square tubes, and into the lower drive stand holes.

Slide the lower end of the drive cylinder into slots at the top of the drive stand. Secure the drive cylinder to the drive stand by placing the upper face plate with two holes over the two studs at the top of the drive stand. Connect all of the hydraulics between the drive cylinder and the hydraulic pump.

With the installation base still at the bottom of the excavation, remove the face plates, control sleeve and short piece of pier pipe from the bracket. Place a lead pier section into the drive stand with the friction reduction collar facing downward. Slide the control sleeve over the pier pipe. Secure the face plate with pier guides over the studs and nuts on the drive stand and the face plates over each pair of studs on pier bracket. Activate the drive cylinder to apply a seating load on the drive stand assembly. When the drive stand has raised enough to remove all of the slack from fabrication tolerances, drill and install at least two 1/2" concrete anchors are required to secure the drive stand in position. If the drive stand is shimmed and not flush with the wall, longer anchor bolts are necessary. Expansion anchor bolts 1/2" x 10" are recommended if the drive stand is shimmed more than one inch.

Retract the drive cylinder to take pressure off the lead pier section. Remove the installation base.

5.02 Driving Pier Pipe

IMPORTANT: The installation base plate must be removed from the bottom of the excavation and the control sleeve must be in place over the pier pipe before proceeding.

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 tools, guides and face plates. Document the force used to drive each section of pier pipe. (Optional – Install an inertia sleeve before installing the next pier section. – See 5.032) Install the coupled end of an extension pier section into the top of the driven pier section. Replace the guides and face plates.

CAUTION: Safe operation dictates that the drive cylinder working pressure shall not be exceeded and all face plates be securely in place during pier installation. When operating near the maximum cylinder pressure, cylinder rod extensions should be restricted to no more than 15 inches to prevent damage to the drive cylinder actuator rod.

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.

5.03 Installing Pier Sleeving (Optional)

In applications where there will be unsupported pier pipe, the optional pier pipe sleeving must be used. Pier sleeving is used to stiffen the pier pipe and to strengthen the coupled joints between pier sections in weak soils or in applications where the pier pipe is unsupported. Sleeving shall extend at least three feet below the area of unsupported pipe or weak soil layer such as in areas where the Standard Penetration Test (SPT) blow count "N" is less than 5.

5.031 Installing External Pier Sleeving (Optional)

The strongest method for increasing pier strength is by installing external 4" diameter sleeving over the pier pipe and insuring that the joints between pier sections and joints between sleeving are staggered by at least 18". The external pier sleeving shall be installed over the pier using the drive stand and drive cylinder. A specialized drive tool for installing the external pier sleeving shall be used to push the sleeve sections over the existing pier pipe. Care must be taken to insure that the joints in the sleeving are staggered a minimum of 12 inches from the joints in the pier pipe. This process shall be continued through the area of pier pipe exposure, weak soil or in areas where additional pier bending strength is required.

5.032 Installing Inertia Sleeve (Optional)

The Inertia Sleeve is a quick and efficient way to provide added strength to the pier pipe and the coupled joints.

NOTE: The inertia sleeve must be installed concurrent with the pier sections. The installer must have general knowledge of depth to suitable load bearing for the pier to be able to calculate the point to commence inertia sleeve installation to be able to fully protect the pipe in the area of weak soils or unsupported pier column length.

When driving pier pipe, the inertia sleeve shall be installed into the pier section prior to inserting the next extension pier section. The coupling end of the inertia sleeve shall be inserted first into the pier pipe. The inertia sleeve shall drop by gravity into the coupling at the bottom end of the extension section. This process shall be continued through the area of weak soil or in areas where additional pier bending strength is required.

5.04 Field Proof Loading

Load test the pier to the required proof load above the design or working load, or until lift of the structure is encountered. We do not recommend proof loading the system to a load greater than 1.5 times the anticipated service load.. The maximum proof load allowed for Model 350 Steel Pier™ system is 64,500 pounds, however many concrete footings will not be able to resist a loading of this magnitude.

Proof loads above the capacity of the drive cylinder may be tested by removing the drive cylinder, installing steel block bridging in the stand to accommodate a 25 to 50 ton short single acting ram between the pier pipe and the steel block. Connect the ram to a hand pump and gauge assembly. Activate the ram to apply the required proof load to the system. Document the results of the proof test. Remove hydraulic drive cylinder and drive stand from the pier bracket.

5.05 Cutting Final Pier Section to Length

After field load testing to verify the capacity of the load bearing stratum below grade, it may be necessary to cut the final pier section to proper elevation. The last section of pier pipe shall be cut to the same elevation as the lowest point of the sides of the bracket for projects requiring lifts from zero up to 4". The pier pipe shall be cut very carefully to insure that the cut end is perpendicular to the axis of the pipe. The pier bracket is shipped with bracket lift rods sized for lifts up to 4". For larger lifts, longer bracket lift rods are required as is a short extension to fit between the Tieback Pier Extension Assembly and the Pier Cap. The length to cut the final pier section will vary depending upon the job site.

5.06 Cutting External Sleeve Section to Length (Optional)

The final piece of external sleeving shall be cut so that extends 6" above the top of the pier pipe in Section 5.05. When using the inertia sleeving, the top of the final section of inertia sleeve shall be cut to terminate 3-1/4" below the top of the pier pipe in Section 5.05.

5.07 Installing the Tieback Pier Extension Assembly

Once the final section of pier pipe and sleeving, if required, is cut to length; the Tieback Pier Extension Assembly is installed by inserting the coupling into the pier pipe. The slot in the pier extension assembly must be facing outward and centered, left to right within the pier bracket. (Note: The control sleeve supplied with the pier bracket is no longer required any longer.)

5.08 Torque Anchor™ Termination

Install the continuous threaded bar through the slots in the helical tieback pier extension assembly and thread the end into the previously installed tieback transition under the footing. Install the Tieback Bearing Plate over the threaded bar and hold in place by hand tightening the two 1/2" diameter nuts on the studs at the pier bracket. Install the bevel washer with the bevel toward the bearing plate. Install the large nut on the all thread bar and hand tighten it against the bevel washer. Install the lower face plate to the pier bracket with two 1/2" nuts and tighten. (Note: One face plate is not used in this application and may be discarded.)

5.09 Load Transfer

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, gauges, and hydraulic hand pump systems. Transfer the structural load to the piers uniformly and evenly by activating many hydraulic rams simultaneously. The hydraulic hand pump is actuated and a force is applied against the top of the pier caps. As the load is transferred from the foundation to the piers; the interior and exterior of the structure must be carefully monitored to insure that the restoration occurs according to plan and the structure is stabilized or lifted to the design elevation. As each placement reaches the desired load and/or elevation, a 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 located above the pier caps shall be advanced to the surface of the pier cap and secured to maintain final elevation.

The tieback nut shall then be tightened securely against the Tieback Bearing Plate or shall be tightened to the torque specified by the engineer to seat the tieback and to impose a preload on the tieback anchor. In critical applications, or when specified, the installer shall place a hollow plunger hydraulic cylinder and jack spacer over the all-thread bars from the tieback anchor and activate the cylinder to preload the system as specified. Once loaded, the nut on the all-thread bar and then the nuts on the Tieback Bearing Plate shall be secured.

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

5.10 Backfill and Cleanup

Remove all scrap and other construction debris from the site. Remove all tools and equipment, clean them and store them. The excavations shall now be backfilled using the soil that was removed and stored nearby. The backfill shall be placed into the holes in small lifts of 6" to 8" and then properly tamped to achieve maximum density. After the backfilling operation is complete, the soil at the perimeter must have a positive slope away from the perimeter of the foundation.

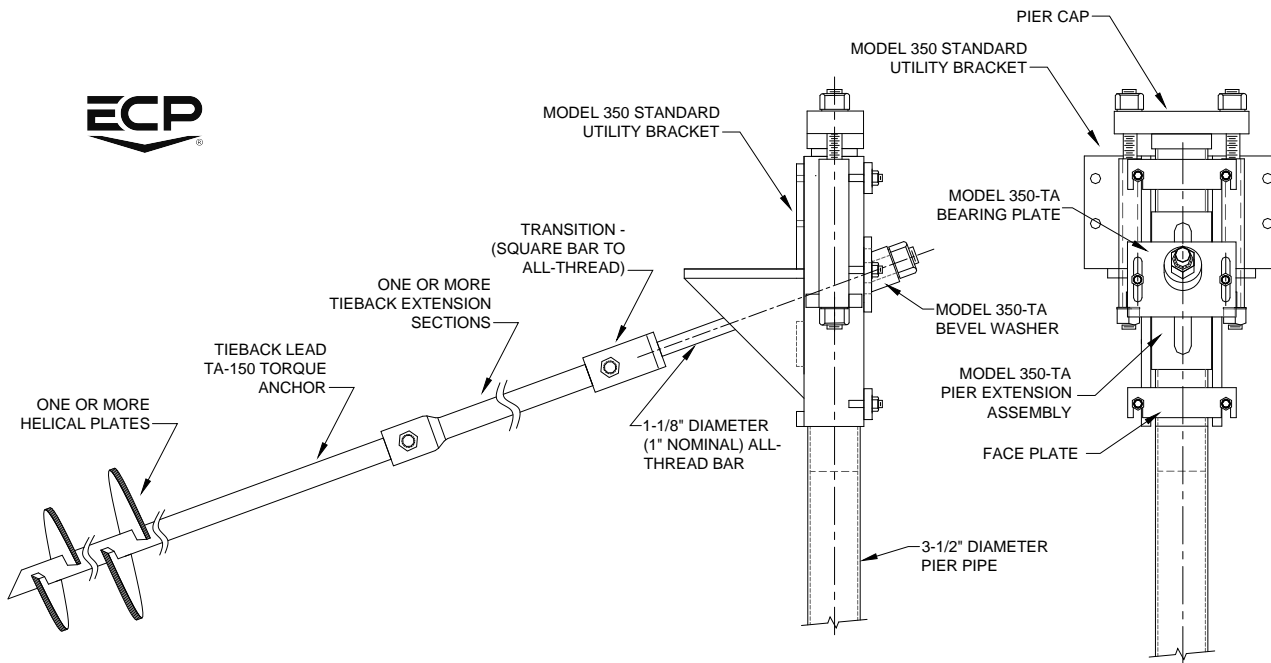
Dispose of all construction debris in a safe and legal manner.

END OF SPECIFICATION

Earth Contact Products, LLC reserves the right to change design features, specifications and products without notice, consistent with our efforts toward continuous product improvement. Please check with Engineering Department, Earth Contact Products to verify that you are using the most recent information and specifications.

Model 350 ECP Steel Pier™, Model 350-TA Torque Anchor Adapter & TAF-150 Helical Torque Anchor™ Tieback Systems

- **Model 350 Ultimate Capacity – 86,000 lb.**
- **Model 350 Max. Proof Test – 64,500 lb.**
- **74 Square Inches Bearing Surface**
- **Installs From Outside or Inside Structure**
- **Friction Reduction Collar On Lead Pier Section**
- **3-1/2" Diameter High Strength, Galvanized Tubular Pier Pipe**
- **Tubular Pier Pipe Installs To Rock or Verified Load Bearing Stratum**
- **Installs With Little or No Vibration**
- **100% of Piers Proof Tested at Installation**
- **1-1/2" Solid Square Shaft Helical Tieback Torque Anchor™ for Lateral Support**
- **Ultimate Tieback Capacity – 70,000 lb.**
- **Tieback Installation Angle – 15° to 20°**
- **Model 350-TA Assembly Required to Connect Bracket to Tieback Anchor**
- **Manufacturer's Warranty**



Model 350 ECP Steel Pier™ System, ECP TA-150 Torque Anchor™ Tieback and Model 350-TA Tieback Adapter Assembly

The capacity of the Model 350 ECP Steel Pier™ foundation support system is a function of the capacity of pier pipe and soil surrounding the pipe, capacity of the load bearing stratum, foundation bracket capacity, foundation strength and strength of the bracket to foundation connection. The capacity of the TA-150 Torque Anchor™ brand Helical Tieback system is directly related to the soil conditions at the site. Actual capacities could be lower than the rated ultimate capacity or of the Steel Pier™ System or the mechanical capacity Torque Anchor™ Tieback system after subjected to Factor of Safety of at least 2.0.

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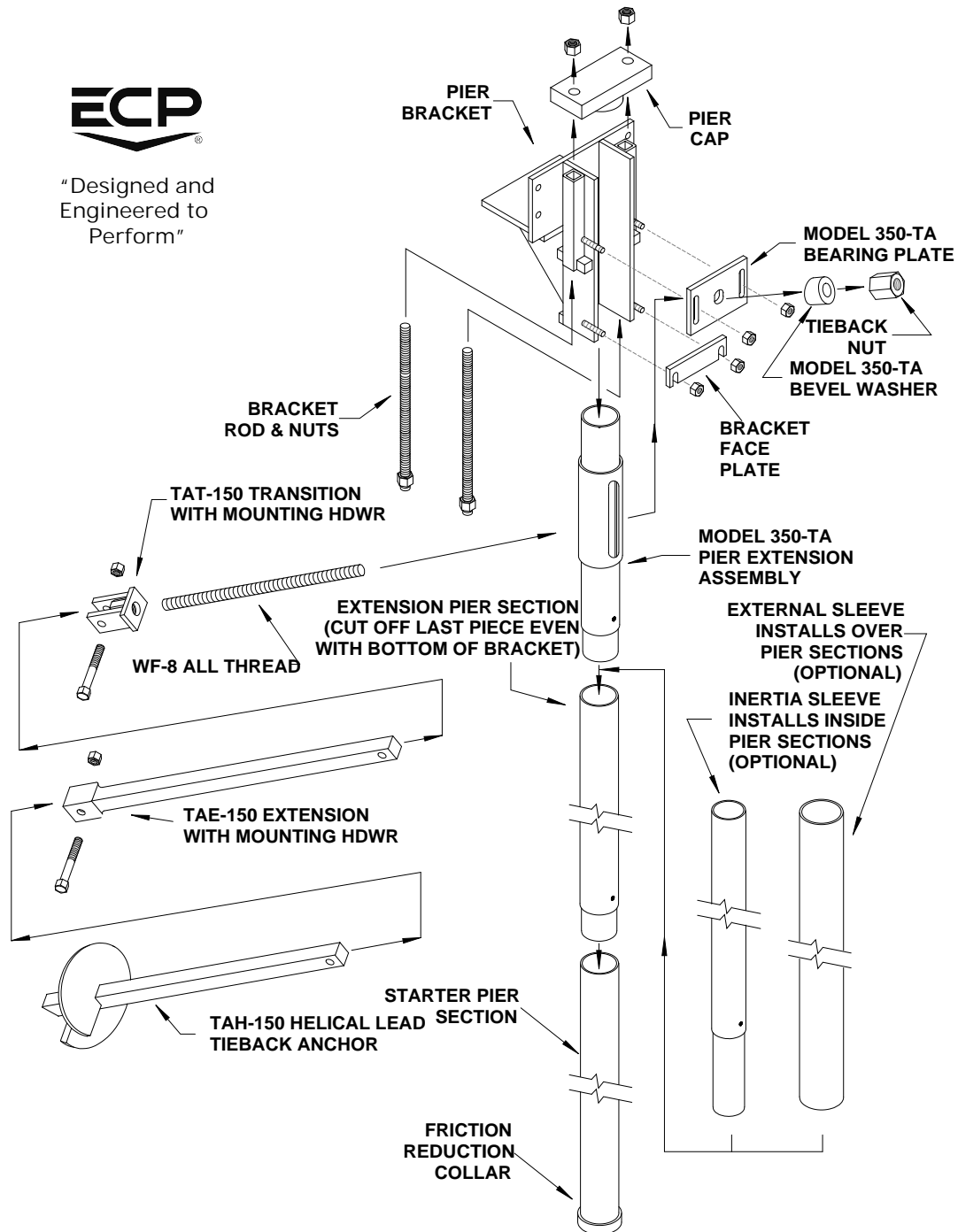


"Designed and
Engineered to
Perform"

Assembly Configuration for the Model 350 ECP Steel Pier™ , TAH-150 Helical Torque Anchor™ Tieback Systems & Model 350-TA Torque Anchor Adapter



"Designed and
Engineered to
Perform"



The capacity of the Model 350 ECP Steel Pier™ foundation support system is a function of the capacity of pier pipe and soil surrounding the pipe, capacity of the load bearing stratum, foundation bracket capacity, foundation strength and strength of the bracket to foundation connection. The capacity of the TA-150 Torque Anchor™ brand Helical Tieback system is directly related to the soil conditions at the site. Actual capacities could be lower than the rated ultimate capacity or of the Steel Pier™ System or the mechanical capacity Torque Anchor™ Tieback system after subjected to Factor of Safety of at least 2.0.