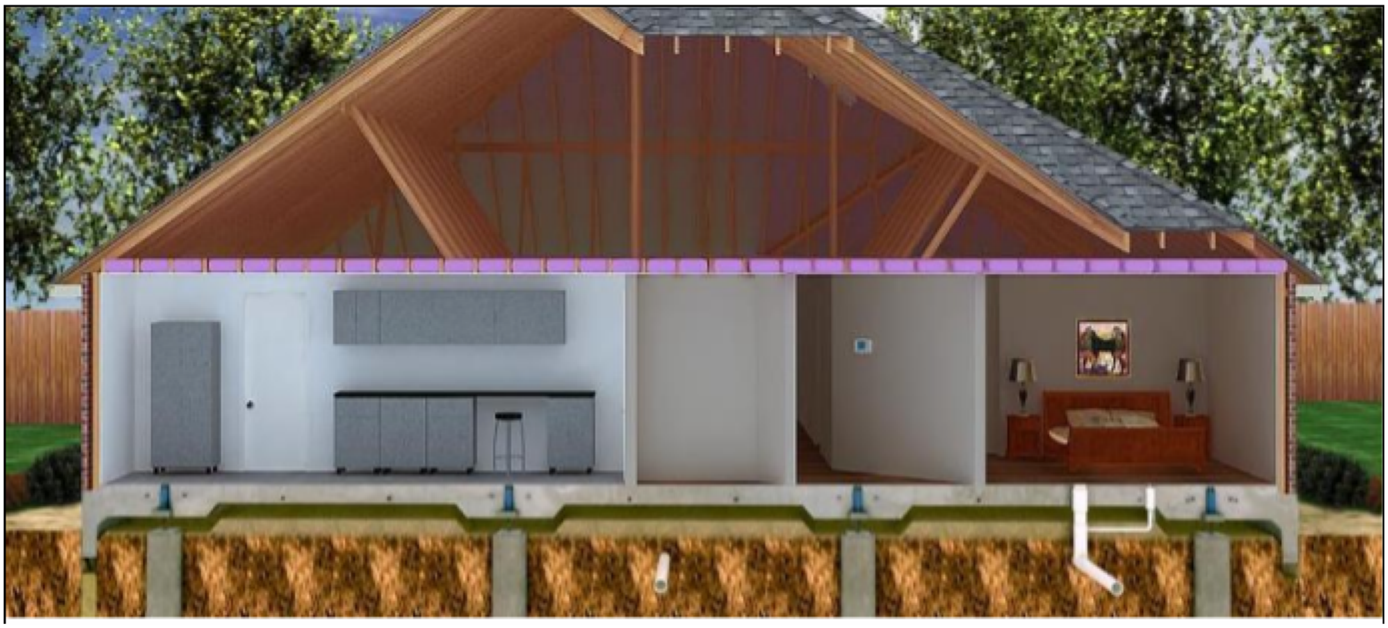
Section 1. Overview

This Installation Procedure Manual reflects current industry best practices for installation of the SlabTek System which has been accumulated through experience with numerous contractors and engineers. Soil expansion and contraction that due to changes in moisture content, cause the vast majorityof concrete slab failures in regions where highly expansive soils are found. Properly installed, the SlabTek System effectively protects a concrete slab foundation from damage due to expansive soils by providing a void under the slab of greater height than the maximum soil expansion. This is accomplished with a patented system using a lifting mechanism which sits atop a suitably sized array of reinforced concrete or helical piers beneath the slab.



The SlabTek System Creates a protective void between slab and expansive soils.

Reducing the incidence of foundation distress due to soil movement is only one of the many advantages of the SlabTek System. Other advantages include:

- Significantly simplified site preparation compared to typical slab-on-grade construction.
- Labor and material savings for most projects due to the elimination of all internal beams, and no requirement for soil modifications

The SlabTek lifting mechanism can be incorporated into a concrete slab with rebar reinforcement, post-tension cable reinforcement, or a combination of both post-tension cable and rebar. For the purpose of this document, the example provided in this document illustrates a typical 30-40’ x 60-80’ two-way flat-plate suspended post-tension foundation on piers, poured on-grade and lifting after installation to provide a void between the foundation and the soil. This void allows for seasonal movement of the soil without affecting the foundation.

This document does not dictate one single, specific method for installation of the SlabTek System, but rather provides minimum requirements which must be met to ensure proper functioning of the foundation.

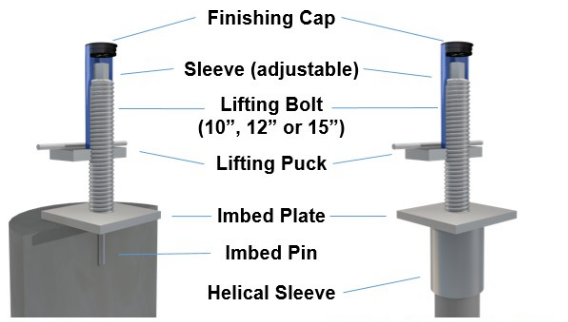
This document provides the minimum requirements for proper installation of the SlabTek System, in the context of a detailed step-by-step overview of an example SlabTek installation. The example given is solely a reference to engineers and contractors who may be unfamiliar with this foundation.

Throughout this installation example, options and recommendations are discussed. These installation recommendations follow procedures that have gained wide acceptance by builders since the first installation in 2005.

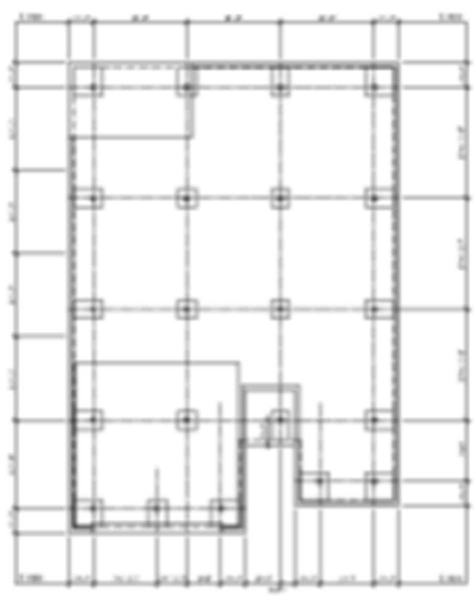
Section 2. Layout and Installation of Forms, Beams, and Piers

2.1. General Description

2.1.1. The SlabTek System consists of lifting mechanisms (mechs) installed atop an array of piers, which together support a (typically) 5”-6” thick reinforced concrete slab. Since the slab is only supported at pier locations, grade beams are not required. The number, location, and type of piers is specified in the structural drawing package. Piers can be traditional concrete piers or steel helical piers. Piers are typically arranged in a rectangular grid which enables each post-tension (PT) cable to align with an entire row, or column of piers. In a (nominally) 26” square region, centered on each pier, the (nominally) 5” slab is thickened to (nominally) 10”. This “capital” serves to distribute high structural loads present at each pier, evenly to the surrounding slab. A rectangular grid of rebar is centered over each capital. These rebar grids are aligned with, and tied to, the PT cable grid. SlabTek foundations do not require a perimeter beam for structural support, but most slabs include a perimeter beam to provide a barrier to protect the void produced under the slab after lifting from moisture, erosion, and animals. Perimeter (or ‘skirt’) beam reinforcement may be provided with rebar or PT cables. The amount that a soil can be expected to expand, and contract depends on the mineral composition of that soil. This change is characterized by a number, the Potential Vertical Rise (PVR) of the soil. Roughly speaking, PVR represents the change in ground level that can be expected as soil’s moisture content changes from very dry to very wet. PVR is generally found in the geotechnical report obtained for the construction site where it is calculated based on scientific analysis of soil samples taken from the site.



Mech for Concrete Piers   Mech for Steel Helical Piers



Typical Rectangular Grid Pier Array

2.1.2. **The SlabTek System must always have a void under the concrete. Industry practices reflect preferably 1.5X the PVR of the soils but should be specified by the Geotechnical Engineer and/or the Engineer of Record.**

2.1.3. Effectiveness of the SlabTek foundation is based on providing and maintaining a sufficient void beneath the slab so that subsequent natural soil movement does not disturb the foundation. Even with proper installation, slab distress can be caused by:

- Improperly designed or installed piers
- Soil movement in excess of the lift height

For this reason, SlabTek highly recommends that engineers and contractors utilizing this foundation pay close attention to pier design and construction to ensure that an appropriate geotechnical report has been consulted.

2.1.4. In cases where the void has been exhausted either by pier settlement or excessive soil expansion, the SlabTek Mechanism may still be used to further lift the slab to limit distress.

2.1.5. Although uncommon, piers can heave and push the slab up while still maintaining the void. In these conditions, the SlabTek Mechanism can be adjusted to lower the slab.

2.2. Site Preparation

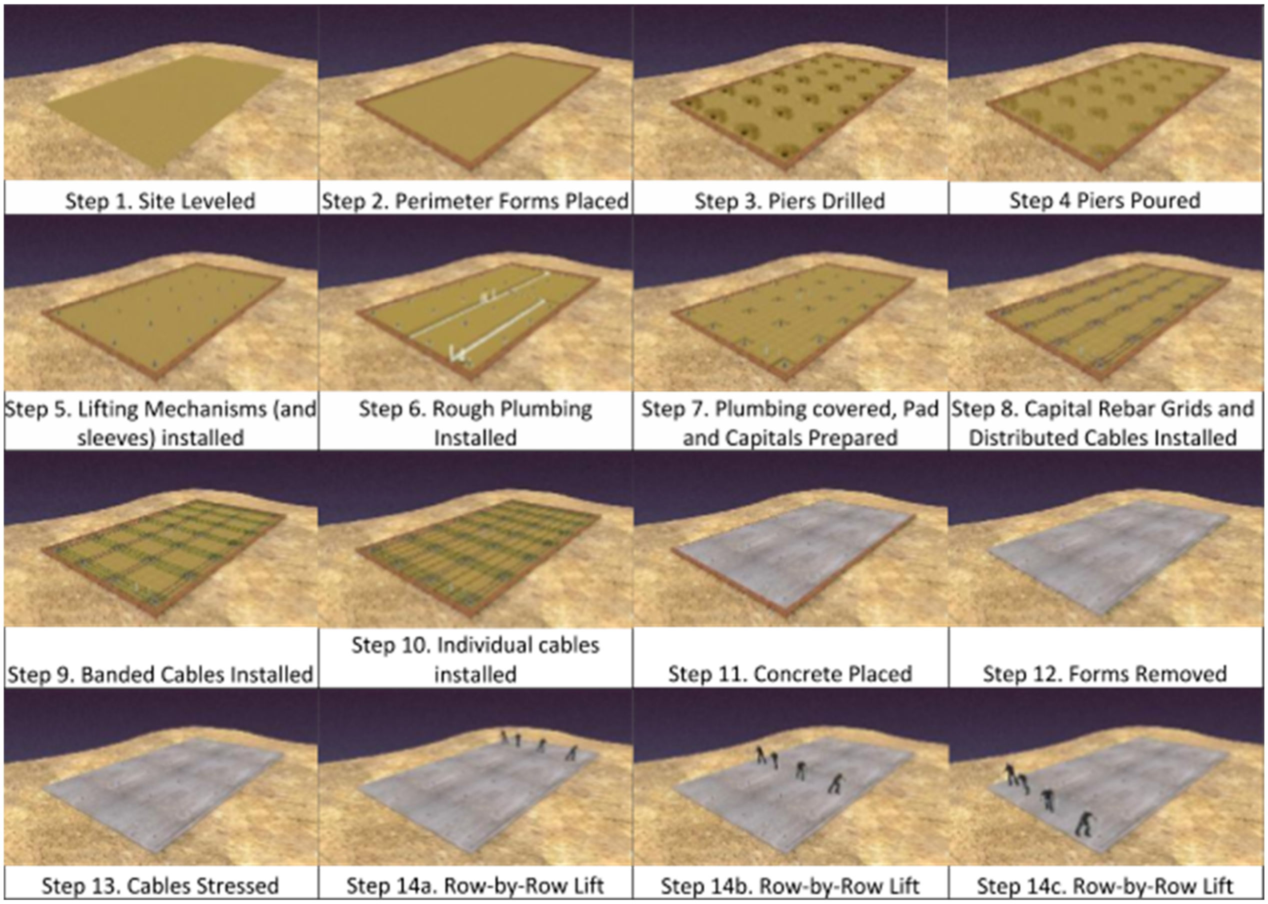
2.2.1. Care should be taken to insure finished floor height meets municipality guidelines on overall height of the building.

2.2.2. Pad site should be excavated to the proper level to account for the specified lift height. For example, a 12” lift will require the top of pad elevation to be 12” plus the thickness of the slab below Final Floor Elevation (FFE).

2.2.3. If it is determined that the lift is to be greater or lower than originally specified, overall building height can be compromised. Check with municipality or feasibility.

2.2.4. Notifications of specified lift changes must be made to the engineer of record as soon as possible.

2.2.5. The following graphic provides overall context for the typical sequence of SlabTek foundation installation steps, and may provide a useful reference when reading the subsequent sections which give detailed descriptions of each construction step.



2.3. Layout of the Forms

2.3.1. Once the site is leveled appropriately, set perimeter form boards at grade level per the structural drawings. For the typical 5” slab thickness, a minimum 8” form board is typically used to allow room to attach the PT cables.

- If 8” form boards are used, the spoils from the excavation of concrete piers and capitals will typically be sufficient to make up the pads for the 5” foundation without the necessity for additional backfill. Form boards taller than 8” may be used, but more backfill will be required to make up the pad.
- Compacting any backfill used to create the pad is not required.

2.3.2. The top of the perimeter form boards should be set at the finished floor level minus the amount the foundation is to be raised. For example, if the finished floor elevation is to be 100'-0" and the foundation is to be raised 6", then set the top of the perimeter forms at 99'-6". When the foundation is elevated 6”, the finished floor will be 100'-0".

2.3.3. AGer the perimeter form boards are placed, locate and mark the center of all piers per the structural drawings.

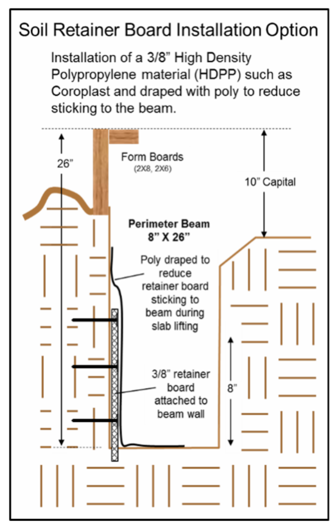
2.4. Creation of the Perimeter Beam

As previously mentioned, a perimeter beam on a SlabTek slab is optional and provides no structural support. The perimeter beam may be installed prior to or aGer the piers are installed. If the perimeter beam is to be installed aGer the piers, the steps in this section may be deferred.

2.4.1. Trench the perimeter beam width and depth as specified on the structural drawings. Beam requirements can be found in the structural drawings. The typical perimeter beam width is 8” with a tolerance of +2” and -0”.

2.4.2. Since the slab will ultimately be li†ed above grade by the SlabTek mechanism, there are conditions that could occur which would create concrete adhesion between the perimeter beam and the surrounding grade, which should be avoided. Failure to prevent adhesion can lead to slab distress. The following items should be considered.

- The sides of the perimeter beam trench must be smooth and have no large irregular surfaces.
- The beam should be of a consistent width vertically as well as horizontally. In no case shall the bottom of the beam be wider than the top of the beam.
- Historically, soils do not usually collapse within the void created under the beam aGer it is raised when the perimeter beam is embedded into compacted stiff materials. However, soils can migrate, collapse, or be pushed into the void cavity if poor drainage exists, a rough grade with compaction is not performed aGer the foundation is liGed, or if the perimeter beam void is exposed upon completion of the liG. One method to control soil erosion under the slab is with the use of soil retainers to maintain the void cavity aGer liG. The figure shows an example of the backfill retainers installed pre-liG, but post-liG methods may also be used. Regardless of the method used, the intent is to provide a barrier to prevent the soils from migrating into the void space created at the bottom of the perimeter beam aGer the liG or during rough/final grade and they stay attached to the perimeter beam thereaGer.



- Certain conditions, such as rain events or high moisture soil content, can cause soil adhesion to the concrete beams. To reduce the potential distress caused by soil adhesion to the slab during the liG, the soil in contact with the perimeter of the slab should be loosened.
- Where trenching of a perimeter beam has encountered rock or other objects and the side-walls cannot be created in a smooth manner, SlabTek also recommends the use of soil retainers to eliminate the possibility of the concrete and rock effectively

attaching the slab to the grade prior to liG. Objects can include, but not limited to tree roots, pre-existing plumbing, concrete, electric, gas lines, and rock.

- The perimeter beam must be able to move freely upward during the liGing process.

2.5. Pier Installation

SlabTek foundations may specify either reinforced concrete piers or helical piers. Refer to the structural drawings for the selected pier type and construction details. Concrete Pier Installation is described in Section 2.5.1 and Helical Pier Installation is described in Section 2.5.2.

2.5.1. Concrete Pier Installation

2.5.1.1. At each of the locations marked in 2.3.3, drill holes of the required diameter, depth, and verticality specified on the structural drawings.

2.5.1.2. Unless noted otherwise on structural drawings, SlabTek requires that all piers be located within a 3" maximum tolerance from the specified location.

- *If the pier cannot be located within tolerance due to conditions in the field, the engineer of record shall be notified prior to proceeding for potential design revisions.*

2.5.1.3. AGer drilling, pier holes shall be cleared of any loose debris and any water removed.

2.5.1.4. Standard practices for concrete piers are as follows, but varies according to the Engineer of Record.

- Concrete for piers shall have compressive strength of at least 3000 psi.
- Concrete for piers shall have a minimum of 5-inch slump. Higher slump ranges are recommended when the concrete will be placed by pumping.
- Pier holes shall not have more than 6” of water at the bottom at the time of pour. If necessary, water shall be pumped out and the concrete can then be poured immediately, once the correct depth has been confirmed.

2.5.1.5. Construct and install reinforcing steel in each pier hole as specified in the structural drawings.

2.5.1.6. Use of pier forms to ensure the proper pier elevation and eventual placement of the SlabTek Mechanism is an industry best practice method. Cut the pier forms to allow a minimum of 6" to remain inside the pier hole. The top of the pier form should be high enough to ensure the proper pier top elevation.

- *Inadequate containment of the wet concrete at the top of the pier can lead to “mushroom” pier tops, which can decrease the structural performance of the pier, and must be avoided.*
- Pier forms may not be necessary when 8” perimeter form boards are used,

since the top of the concrete is typically below original grade level. *Regardless of the perimeter form boards utilized, if the sides of the pier hole at the level of the top of the pier concrete are sufficiently stable, pier forms may be omi1ed.*

2.5.1.7. Pier shaGs shall be filled to the bottom of the pier capitals, which is commonly found to be 10" to 10 ½" below the top of slab concrete per the engineering specification.

- For a typical 10" capital, the maximum tolerances allowed are minus (-) ¾" to plus (+) 1". The minimum capital thickness is 9".
- Thicker capitals are possible but custom sleeves must be made to accommodate the deeper sections.

2.5.1.8. Concrete shall be placed in a manner to avoid shiGing the reinforcing steel during placement

2.5.1.9. Lightly tamp the top of pier concrete to eliminate voids in the upper surface of the pier

2.5.1.10. Trowel the top of the pier concrete to provide a smooth finished surface.

2.5.1.11. Taking concrete cylinders of the concrete mix at the time of the pour to verify the concrete mix meets the design specifications of the structural drawings is an industry best practice.

2.5.1.12. Care should be taken when the pier is located close to a drop. Capital thickness is determined by the low side of the drop and the top of pier is to be poured accordingly.

2.5.1.13. A best practice method is to have all pier holes inspected by the engineer of record or a 3rd party to verify that the quantity, location and depth of piers is in compliance with the structural drawings. Pier depth and any variances from specifications should be recorded and retained.

2.5.2. Helical Pier Installation

2.5.2.1. At each of the locations marked in 2.3.3, insert helical piers that meet or exceed all material and quality specifications contained in the structural drawing package. Installation shall be completed by a certified installer.

2.5.2.2. Unless otherwise specified on structural drawings, SlabTek requires that all piers be located within a 3" maximum tolerance from the specified location

- *If the pier cannot be located within tolerance due to conditions in the field, the engineer of record shall be notified prior to proceeding for potential design revisions.*

The helical pier is measured to assure it is center and cut to the proper height

2.5.2.3. Unless otherwise specified on structural drawings, all SlabTek helical piers require the piers be plumb to within 1 inch in 4 feet.

2.5.2.4. All SlabTek helical piers shall be installed with the upper helix below the active zone depth specified in the structural drawings.

2.5.2.5. All SlabTek helical piers shall be installed according to the manufacturer to resist the demand loads specified on the structural drawings.

2.5.2.6. If required for stability, SlabTek helical piers shall have a lateral stabilizing device installed at each helical pier as specified on the structural drawings. The most common lateral stabilizing device recommended is a non-reinforced concrete helical cap. The cap is created by digging or augering a hole around the top of the helical pier, placing cushion sand as noted in the structural drawings, and pouring the concrete around the top of the helical steel shaG providing lateral stability for the top of the pier. The cap is typically cylindrically shaped with 3000 PSI concrete 12” in diameter and a minimum of 20” deep:


Concrete Cap Poured around Helical Pier top

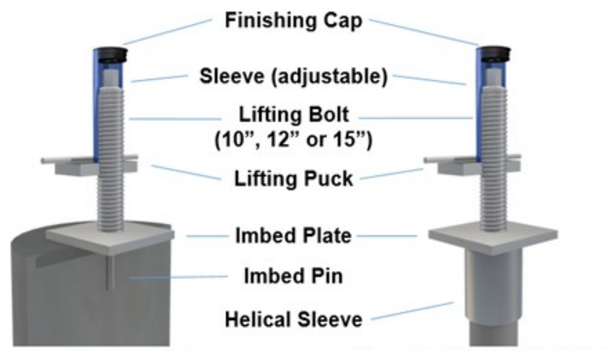
- If the minimum distance between the inner wall of the closest perimeter beam to the outer diameter of the augered pile cap is less than the liG height, then the augered pile cap shall be 4' deep.
- If the minimum distance between the inner wall of the closest plumbing trench to the outer diameter of the augered pile cap is less than the depth of the plumbing trench, then the augered pile cap shall be twice the depth of the plumbing trench.

2.5.2.7. Helicals should be held in the center of the augered hole while the concrete cap is poured, and braced in place while the cap cures assuring that the helical piers be plumb to within 1 inch in 4 feet.

2.5.2.8. AGer all augered pile caps have been poured, trenches shall not be re-routed closer than their depth to the outer diameter of any augered pile cap without the permission of the engineer of record.

2.6. Installation of the SlabTek Li†ing Mechanism (Mech) Base

The SlabTek Mech is available with two baseplate versions, one for concrete piers and one for steel helical piers as shown.



Mech for Concrete Piers
Mech for Steel Helical Piers

In both cases, the base of the mech bears on top of each pier. For concrete piers, this can be done while the concrete is still malleable, using the Wet Installation Method described in 2.6.1, or aGer it has completely hardened using the Dry Installation Method described in 2.6.2. Section 2.6.3 describes the installation procedure for helical piers.

2.6.1. Wet Installation Method

2.6.1.1. The top of pier should typically be 10” below top of concrete or as specified in the foundation design plan.

2.6.1.2. The base of the SlabTek Mech is embedded in the concrete at the top of each pier before the concrete has hardened, but when it is hard enough to prevent the mechanism from “sinking" into the pier.


Pier top ready for Mech

2.6.1.3. The top surface of the pier should have a smooth, voidless surface as noted in sections 2.5.1.9 and 2.5.1.10.

2.6.1.4. The mech should be placed in the center of the pier within a tolerance of plus or minus (±) 1”.

- *If the top of the pier has ‘mushroomed’, the center of the pier shaf and the center of the mushroomed top may be different. Tolerance is measured from the center of the pier <u>shaft</u>.*


Mech Aligned & Set

2.6.1.5. The top of the mech base plate should be embedded flush to the top of the pier.

2.6.1.6. At the time of placement, ensure the protective plug is inserted inside the mech nut well to protect the threads from dirt and debris.

2.6.1.7. Plumb and level each mech assembly without disturbing the concrete under the assembly.

2.6.1.8. Smooth and re-level the top of the pier outside the embed/base plate.

2.6.2. Dry Installation Method

2.6.2.1. The top of pier should be 10-1/2” below the top of concrete or ½” below what is specified in the foundation design plan.


Hole for dry Mech Install

2.6.2.2. The top of the pier should be level and smooth. If necessary, grind to achieve this.

2.6.2.3. Locate the center of the pier within a tolerance of plus or minus (±) 1”.

- *If the top of the pier has ‘mushroomed’, the center of the pier shaf and the center of the mushroomed top may be different. Tolerance is measured from the center of the pier shaf.*

2.6.2.4. Drill a 1/2” to 5/8” diameter hole in the center of the pier vertically, to a depth of 5”.


Mech installed using epoxy

2.6.2.5. Blow out the dust from the drilled hole.

2.6.2.6. Dry-fit the mech to the pier and verify that the mech is plumb and level, and completely seated to the pier.

2.6.2.7. Disassemble, and reassemble using a high-strength, non-shrink grout or equivalent epoxy patching compound on the embed pin & underside of the mech.

2.6.2.8. At the time of placement, ensure the protective plug is inserted inside the mech nut well to protect the threads from dirt and debris.

2.6.2.9. The drilled hole is to be filled with epoxy, Ardex can be used to level the Mech.

2.6.3. Helical Pier Installation Method

2.6.3.1. The shaG of each helical pier must be cut level at the elevation corresponding to the bottom of the capital per the structural drawings. Normally, this elevation is 10-1/2” below the top of concrete insuring contact between the mech and helical.

2.6.3.2. Slide the helical pier mech sleeve onto the cut shaG.

2.6.3.3. At time of placement, ensure the protective plug is inserted inside the mech nut well to protect the threads from dirt and debris.

2.6.4. Verification of Piers and Mechanisms

2.6.4.1. Industry best practice is that all piers and mechanisms be verified by the builder and contractor before beginning placement of the foundation so that any remediation required due to field conditions can be made without disrupting the foundation components. The inspection should include:

- proper level and plumb condition of the mech
- proper location of the mech in the center of the pier
- proper elevation of the pier and mech
- proper number of piers per the structural drawings
- the top of jack and shim piers provide ample room to install the required void box atop of the pier and below the bottom of beam per the structural drawings

Section 3. Plumbing Installation

SlabTek does not dictate any method for the installation of plumbing within the foundation but provides general guidelines to methods commonly utilized for suspended foundations, as well as methods for elevating the plumbing with the foundation. The plumbing and its performance with this foundation is not the responsibility of SlabTek and should be coordinated by the builder/contractor. It is not the intention of this guidance to detail or specify the process of plumbing installation. Instead, this section addresses some minimum requirements and recommendations for plumbing installation on elevated foundation systems.

There are two common methods for installing plumbing with SlabTek foundations: Conventional and Suspended. These are described in Sections 3.1 and 3.2 respectively.

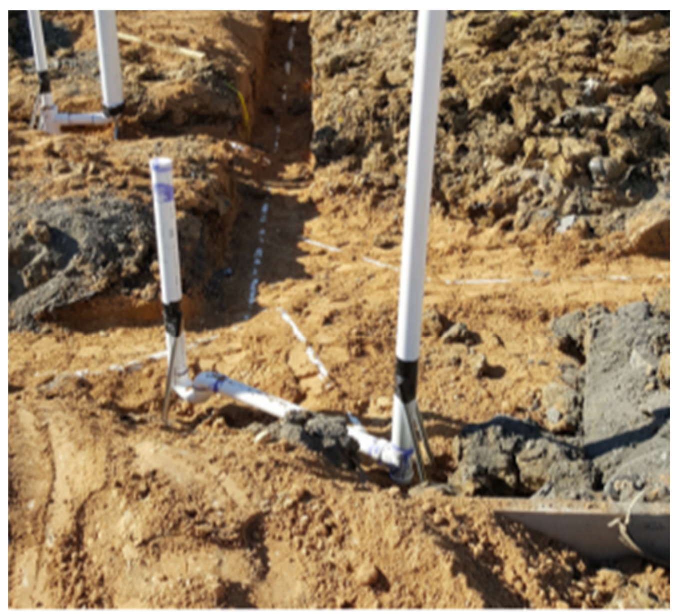
- **Note that plumbing cannot penetrate the perimeter beam when using the Conventional method, however it may do so when the Suspended method is utilized.**

3.1. Conventional Plumbing for Suspended Foundations

The most common method of installing plumbing in suspended foundations is to embed the plumbing lines in the sub-grade with sufficient cushioning to allow eventual soil movement to flow around the plumbing lines. Since the SlabTek slab is raised aGer curing, plumbing stacks must be sleeved to allow the foundation to be elevated without disturbing the plumbing; only the outer sleeves are raised with the slab.

3.1.1. Plumbing shall not be installed directly on exposed/compacted soils aGer trenching.

3.1.2. In accordance with IRC P2604.1 and IPC 306.2.1, it is required that routes for drain lines be over-trenched (below the bottom of the drainage pipe) by not less than twice the largest pipe diameter. As noted in section 2.1.2, industry best practice is to over-trench a depth of 1.5 x PVR. The trench shall then be filled with cushion sand to a depth of 1.5 x PVR such that the top of the drainage pipe is not less than 5” below the top of the perimeter form boards, except where stacks penetrate the slab.



Plumbing Installation using Cushion Sand

3.1.3. As an additional best practice, void boxes should be placed under the elbows of major plumbing stacks protruding through the slab and at all end-of-line 90° elbows.

3.1.4. Plumbing shall not be installed in or through the perimeter beams.

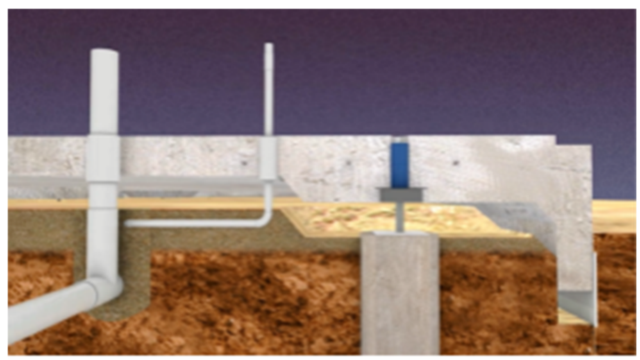
3.1.5. Plumbing shall not protrude vertically through capitals, but can be routed entirely beneath them.

3.1.6. Vertical stacks shall be sleeved per SlabTek Plumbing Installation Recommendations, with the void between the stack and sleeve temporarily sealed to ensure that no concrete penetrates into the void space between the sleeve and the stack during the pour.

3.1.7. Industry best practices is to inspect any rough plumbing installed in over-trenched runs before they are covered with sand. This inspection should include, but is not limited to:

- Depth of over-trenching and quality of cushion material
- Placement of void boxes under major elbows and end-of-line 90° elbows (if used)
- Stacks and sleeves are plumb (to avoid binding when slab is liGed vertically)
- Sufficient temporary sealing of sleeves to stacks (to prevent concrete intrusion)

3.1.8. Plumbing codes (IPC 315.1, IRC P2606.1) require the plumbing sleeves be sealed (bonded). Because SlabTek is liGed, this should be done aGer the foundation has been elevated to reduce the potential for movement associated with soil movement. Bonding the plumbing stacks to the sleeve can be done by several methods including, but not limited to:

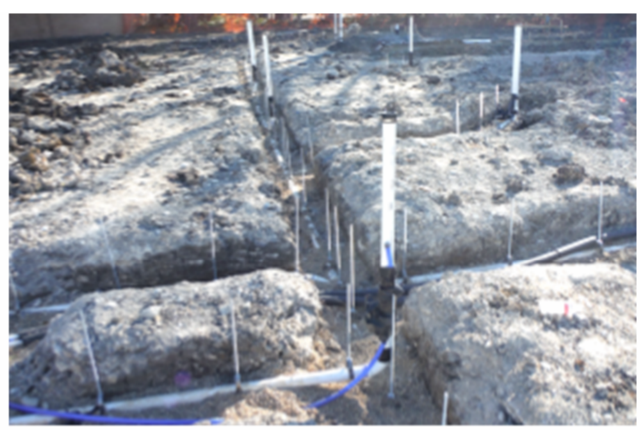


Sleeved stacks for conventional in-ground plumbing

- High strength, non-shrink grout or epoxy with 3,000 psi compressive strength minimum at least 2” deep below top of concrete
- Use PVC glue to secure a modified PVC reducer to both the stack and its sleeve

3.2. Suspended Plumbing

An alternative method of plumbing installation for a SlabTek foundation, is to attach the plumbing lines to the slab with hangers and liG it above the subgrade along with the slab. This method has the advantage of minimizing differential movement between plumbing and slab by eliminating the sleeves noted in Section 3.1. This can be done by several methods, one of which is described below:



Suspended Plumbing with Threaded Rod

3.2.1. Set the plumbing lines on a sand bed a minimum of 6” in depth.

3.2.2. Install supports to the drain lines, at an appropriate spacing, to extend into the slab area.

- Plumbing lines should bear on #3 rebar bent in a “U" shape spaced accordingly along the plumbing trench. Alternatively, all-thread rods and clevises can be used.
- Other similar liGing systems may be used.

3.2.3. It is desirable to minimize the weight resting on top of the suspended plumbing, in order to avoid any possible deformation or damage to the lines. This can be accomplished in several ways:

- Plumbing trenches may be filled with a light material with sufficient structural integrity to support the concrete during the pour. Spray foam insulation is one such material. To minimize material costs, cardboard forms to restrict the spray foam to just the width of the drain line backfilled with dirt
- Plumbing trenches may be covered with an inverted metal pan with sufficient stiffness to support the concrete during the pour.
- Alternately, the top of the plumbing may be covered with a void box or other material. The space above the void box can be filled with local soil material or sand to 5” below the top of perimeter forms.

Suspended Plumbing with light-weight material covering plumbing prior to the slab pour and slab lift

3.2.4. Since they will be liGed along with the slab, plumbing stacks extend up through the foundation without the use of a plumbing sleeve (except as required per code for protection against concrete).

3.2.5. Plumbing within the perimeter beams does not require void boxes as it will be liGed with the foundation, (but protective material may be required per code).

3.2.6. AGer the foundation is prepared, the #3 dowels (or equivalent liGing support) should be bent to reside within the near center of the slab. When the slab is liGed, these bars will suspend the plumbing through the fill material or void boxes, which are designed to deteriorate.

Section 4. Foundation Installation

4.1. Perimeter Beam

If the perimeter beam was not installed prior to pier installation, it must be installed at this point in the sequence. Refer to section 2.4 for the perimeter beam installation procedure.

4.2. Slab and Capitals

4.2.1. AGer the plumbing and perimeter beams have been installed, the pad (which will be the lower form for the slab concrete) needs to be formed to the engineering plans. For a typical 5” thick slab, it needs to be formed to an elevation of 5" below the top of perimeter form boards. The use of local soils or cushion sand is acceptable. The materials utilized for the pad do not require compaction. In accordance with ACI 117-10 Section 4.5, the slab should be installed with an overall average thickness of 5" with a tolerance of minus (-) 1/4” to plus (+) 3/8”. Polyethylene film may be used, but is not required since the slab will be elevated and no moisture barrier is needed.

4.2.2. Excavate the (typically 26” square) capitals around each pier as noted on the structural drawings. The tolerance of the capitals in depth is plus (+) 1” or minus (-) ¾”. The width tolerance is minus (-) 2” or plus (+) 6” measured at the bottom of the capital.

4.2.3. The capitals are depicted with vertical edges, however in practice it is acceptable for the edges to slope outward from bottom to top as long as dimensions are within tolerance.

4.2.4. For capitals located close to drops, the low side of the drop controls.

Piers, Mechanisms, Capitals, Perimeter Beams, Pad prepared – ready for installation of reinforcement

4.3. Cables and Steel

4.3.1. Perimeter beams typically utilize some degree of reinforcing such as a single #5 rebar, 6" above the bottom of the beam, or a post-tensioned cable located between 3” and 5” from the bottom of the beam. Refer to the structural drawings.

4.3.2. All cable anchors must be installed in a manner that allows for 4½” concrete coverage over the top of the anchor, including beneath brick ledges.

4.3.3. The following examples are for designs that utilize two Distributed Cables (DC1) typically run in the direction of the shorter span between piers and straddle each pier in a given column of piers. Also four Banded Cables (BC) typically run in the direction of the longer span between piers and straddle each pier in a given column of piers. Engineering designs may vary and should be followed, but the typical installation procedure is described below.

4.3.4. The DC1 cables are the first cables to be installed within the foundation. These cable pairs lay on the ground, one cable approximately 6” from each side of the Mech as noted on the structural drawings. These cables simply lay on the ground to be secured to the form boards later.

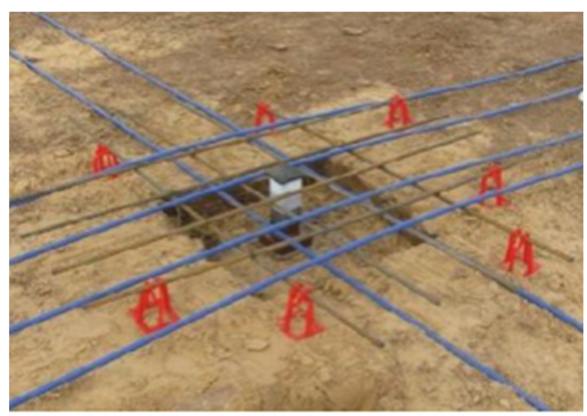
4.3.4.1. The DC1 are individually attached to the form boards at locations specified in the structural drawings.

4.3.4.2. The DC1 may be deflected as necessary, in order to ensure that they maintain the proper straddle of all the mechs in their column.

Rebar grid being formed using jig

4.3.5. Using a jig created for the purpose, construct one rebar grid for each pier, from four (4) #4 rebar 5 feet in length at 8" apart, on center, and a second set of four identical bars 90 degrees offset from, and above the first. Tie all intersections with wire. The intersections will occur at (nominally) 18”, 26”, 34”, and 42” from both ends of all bars.

4.3.5.1. Install one rebar grid over each pier such that the bottom bars are parallel to the DC1. The grid will completely cover the capital excavation.



Detail of capital reinforcement

4.3.5.2. In order to provide 1” clear cover over the top of the rebar grid, support the bottom bars of each rebar grid with 4" chairs near the end of the bars where it rests on the pad (not the capital). Rebar stakes can also be used.

4.3.5.3. At each pier, raise the DC1 resting on the ground and tie to the bottom side of each of the upper four bars of the steel cage at a spacing of 6" to each side of the Mech (or 12" apart).

4.3.5.4. Allow cables to drape down between piers and support with 1½" chairs.

4.3.6. The BC cables are installed in sets as noted on the structural drawings. There are as many sets of BCs as there are rows of piers in the foundation.

4.3.6.1. Lay each set of four (4) cables on top of the #4 grid at each pier and tie to the lower bars of the steel cage, as well as to the DC already in place running in the opposite direction. These cables within the band should be spaced 12" apart on center with two cables on each side of the mech.

4.3.6.2. The BC cables are individually attached to the form boards at locations specified in the structural drawings.

4.3.6.3. The BC may be deflected as necessary, in order to ensure that they maintain the proper straddle of all the mechs in their row.

4.3.6.4. Allow these cables to drape down between piers and support with 1½" chairs.

4.3.6.5. The BC must be secured at the midpoints between piers to maintain their spacing and be kept from moving. One method is to tie a 3'-6" section of #3 or #4 rebar across the four (4) cables at the approximate midpoint between each pier column and secure with rebar stake or 1-1/2" chair.

4.3.7. Install the individual PT cables that run parallel to, and between, the DC as noted on the structural drawings. These cables shall be "profiled" within the slab as described below.

4.3.7.1. Install cables to provide 1" of clear cover from top of cable to top of slab at the point where each cable crosses over the BC. Allow cables to drape down between piers and support with 1½" chairs.

4.3.7.2. These cables must also be secured at the high points where they cross over the BC, to maintain their spacing and to keep them from moving. One method to do this is to tie a #4 rebar across these cables and support the rebar with 4" chairs. Rebar stakes can be used also.

4.3.8. Install non-profiled shrinkage cables (SC) as noted on the structural drawings. These cables run parallel to, and between, the BCs. The shrinkage cables remain at a constant height between each row of piers, and they are supported by simply tying them at all intersections to cables running perpendicular.

4.3.9. Install any steel "L" bars as noted per the structural drawings. Each perimeter pier, and beams without beam cables require the use of “L” bars.

4.3.9.1. The steel “L” bars at the pier locations are secured to the rebar grid when possible. Each perimeter pier must have "L" bars attached to the steel mat. Each pier will require 4 to 8 “L” bars.

4.3.9.2. When required, a #3 nose bar can be used to secure the steel "L” bars in place.

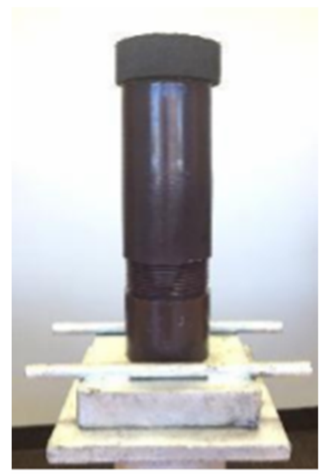
4.3.9.3. Secure the bottom of the steel "L" bars to the bottom reinforcing in the beam.

4.3.9.4. The bottom of the steel "L" bars should stop 2" short from the bottom of the beam.

4.3.9.5. When noted on the plans, steel “L” bars may be required within the perimeter beam away from the piers. To secure these bars, again a #3 nose bar may be used along with the bottom reinforcing in the beam for support. This is necessary when rebar is used instead of PT cable for reinforcement of the perimeter beam.

4.4. Attachment of SlabTek Mech Sleeves

After the foundation is prepared, and before the concrete is poured, sleeves must be fitted to each mech base installed in Section 2.6.


Sleeve on Mech Base

4.4.1. Remove the temporary cap from the nut well of each lifting puck.

4.4.2. Apply a generous amount of thread lubricant to the nut well (Jet- Lube 550® Extreme or equivalent).

4.4.3. Set the lower plastic sleeve onto the lifting puck and secure using the base plug.

4.4.4. Screw the upper sleeve to the lower sleeve.

4.4.5. Insert the foam installation cap onto the upper sleeve.

4.4.6. Screw the sleeve assembly up or down to adjust the top of the foam installation cap to the desired top of the finished pour elevation. The maximum tolerance allowed is minus (-) ¾” or plus (+) 1”. (Therefore, the minimum capital thickness is 9¼” and the maximum is 11”.)

4.4.7. In the event that the capital thickness is smaller than the 9¼”, the engineer of record should be notified for further evaluation. This is easily detectable in the field if the foam caps extend above the pour elevation with the sleeves tightened down to the smallest height.

4.4.8. When sleeves are fully extended while maintaining a minimum of ½” of bite remaining in the threads, this is the maximum capital thickness that the sleeve can accommodate. If conditions occur greater in depth than this, sleeve extensions must be utilized. This condition does not need to be evaluated by the engineer of record.

4.4.9. Verify that all cables and rebar are at least 1” away from the sleeve assemblies.

4.5. Jack And Shim Installation

4.5.1. Refer to the structural drawing details for the proper installation of the required leave-outs on all jack and shim piers. This is critical to ensure that the proper void between the bottom of the beam and atop of pier is maintained aGer the slab is poured that will allow for a jack to be placed in the void for the foundation liG. **Note: Unless the contractor uses plywood or other means to temporarily cover/protect the jack and shim pier hole, it is recommended that pictures of the installed leave-outs be taken if the contractor intends to backfill the jack and shim holes for the purpose of the engineer of record’s pre-pour inspection.**

4.6. Inspection Prior to Pouring the Foundation

SlabTek recommends that the entire foundation be inspected by the engineer of record to ensure the installation has met the requirements of the structural drawings prior to placement of the concrete.

4.7. Pouring the Foundation

The foundation should be poured based upon accepted principles of concrete placement. There are no special requirements of the concrete pour unique to Slab-Tek, with the exception of using a continuous mon olithic pour to reduce the potential of forming cold joints. SlabTek recommends:

- The concrete be poured away from mech sleeves to prevent damage to the sleeves.
- Extra sleeves be on hand at the time of pour to replace any broken or damaged sleeves immediately.

Placing concrete on the prepared pad

4.7.1. The foam cap of the mech may be used as a level screed for the placement of the concrete. The foam caps will not disturb the finish of the concrete.

4.7.2. Cold-joints and honeycombs must be avoided as they may have a detrimental effect on the structural performance of the foundation.

4.7.3. The concrete should be poured using a mix that meets or exceeds the required strength as noted on the structural drawings.

4.7.4. SlabTek recommends having the engineer of record or a 3rd party witness the pour to verify placement of the concrete per the structural drawings.

4.7.5. Industry best practices includes taking concrete cylinders of the concrete mix at the time of pour to verify the concrete mix meets the design specifications of the structural drawings.

4.8. Stressing of Foundation (PT only)

For slabs using PT reinforcement,

4.8.1. If pre-stressing of the foundation at 24 hours is to be performed, it is industry practice to tension the cables to 30% of their ultimate capacity.

4.8.2. It is typical industry practice that the foundation should receive full stressing at 7 to 10 days aGer the foundation is poured. The concrete must obtain minimum strengths of 2500 psi at time of full stressing.

Section 5. Foundation Li†

The following sections are provided as an overview of the lifi process, and do not constitute training. Personnel should not aMempt to execute these procedures unless and until they have been specifically trained to do so.

5.1. Overall

5.1.1. The foundation cannot be liGed until all cables are stressed and the concrete has cured to a minimum of 2500 psi based upon Post-Tension Industry standards. This typically occurs within 7 days from the time of pour.

5.1.2. SlabTek recommends performing the liG prior to commencement of framing so that the framing can be installed in the most level conditions, and so that the liGing crew is least impeded by physical obstacles. Structurally, however, the foundation can be liGed during the framing stage, but is not recommended.

5.2. Concrete Contractor Preparation for Li†ing the Foundation

It is the concrete contractor's responsibility to ensure that the foundation is ready for the scheduled li†ing. As such and prior to the li†, all pier locations must be located, all hold-down plugs removed and the foam plug temporarily reinserted, and that the cables have been successfully stressed.

5.2.1. Once the slab has set up to the point of the final trowel "burn in," the plastic sleeve foam and nylon hold-down plugs should be removed to ensure (1) all piers can be accounted for and (2) that no concrete has seeped into the plastic sleeve which will prevent the nylon hold-down plug from being removed. Alternatively, this can be done when the form boards are being removed if done relatively soon aGer the foundation pour.

5.2.2. Once the nylon hold-down plug has been removed, the foam plug should be reinserted to keep the chamber of the sleeve from being compromised by external elements.

5.2.3. All jack and shim pier locations should be excavated to (1) remove the void box or material used to create the required void per the structural drawings and (2) to allow ample working room for the liG contractor to adequately perform the liG process without being obstructed.

5.2.4. In the event a pier cannot be located or the chamber in the plastic sleeve or required void at the jack and shim pier has been compromised, early detection of such allows ample time for necessary remedial action required to rectify the issue.

5.3. Li† Contractor Preparation for Li†ing the Foundation

5.3.1. A hammer test is performed at each pier location with the results recorded to verify the adequacy of the compressive strength of the concrete meets the required minimum 2500 psi.

5.3.2. A reference/benchmark is taken on a permanent or non-movable object outside the foundation area, such as a curb by a water meter, etc., to establish a zero point. Original Construction Elevations (OCE) of the slab are then taken at each liGing mechanism and recorded for reference throughout the liG.

5.3.3. For foundations with conventional plumbing installed, marks are made on the plumbing vertical stacks in 1-inch increments up to the height of the liG and is used as a reference point to observe if the plumbing is liGing with the slab.

5.3.4. LiGing Mechanism Preparation

As mentioned earlier, it is the concrete contractor's responsibility to ensure that all pier locations have been located and all hold-down plugs have been removed prior to arrival of the li†ing contractor.

5.3.4.1. Remove the foam cap from the adjustable sleeve and any debris or other matter that falls into the chamber in the process.

5.3.4.2. Remove the base plug from the threaded puck (if not previously done by the concrete contractor noted above)

5.3.4.3. Inspect the mechanism to ensure the threads are undamaged and void of debris.

5.3.4.4. If the threads have been damaged or if there is debris embedded in the threaded puck, the threaded puck must be cleaned with a wire brush to remove any fine particles or rust. A tapered bolt may be required to fix any thread damage. Thoroughly vacuum out any debris from the threaded puck.

5.3.4.5. Check the liGing bolt for rust. Clean liGing bolt with wire brush.

5.3.5. Bolt Lubrication

5.3.5.1. Apply JetLube 550® Extreme to portion of the threads that will engage during the liGing process. This is roughly equal to the LiG Height plus 2” measured from the bottom of the bolt. This should include the bottom of the bolt and nub if present.

Lubricating lifting bolt threads

5.3.5.2. Insert the liGing bolt into threaded puck and turn until resistance against the piers is encountered.

5.4. Li†ing of the Foundation

The initial liG intends only to raise each mech by exactly the same amount. Therefore, if the foundation is out of level at OCE, it should be relatively the same out-of-level condition aGer the initial liG. If approved by the engineer of record and builder/client, additional adjustment can be performed aGer initial liG. SlabTek will not remove localized out-of-level conditions on the surface of the slab due to imperfections of the concrete pour.

Two methods of raising a SlabTek foundation system are *“all at once”* and *“row by row”*. Either method can use manual or pneumatic devices. Each full turn of a SlabTek bolt provides 1/3” of liG.

5.4.1. If a foundation to be liGed includes a dropped beam or stem wall, SlabTek recommends using the “row by row” liG method only if it is possible to raise the structure parallel to the dropped beam or stem wall, so as not to create bending forces within the noted sections. If this is not possible, SlabTek does not recommend using the “row by row” method on these types of foundations.

5.4.2. When raising the foundation “all at once”, all mechanisms should be simultaneously turned at an equal rate to ensure the foundation is being raised evenly until the foundation is elevated to the height noted on the structural drawings.

5.4.3. When raising the foundation “row by row”, simultaneously turn all the bolts in one row, one full turn. SlabTek recommends that a row be selected across the short dimension of the foundation, but the procedure can be performed in the long direction.

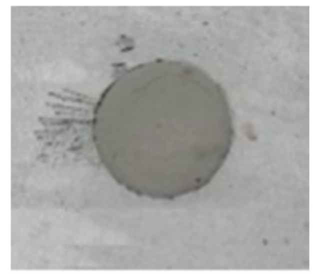
5.4.3.1. AGer the first row is raised, the crew proceeds to the next row & repeats the process. AGer all rows in the foundation have been raised one full turn (1/3”), the crew returns to the first row and starts another pass.

- *Check the elevations of the slab every six (6) turns (2” of lif) or less to verify lif* *and to ensure the slab does not get out of sequence and bind the lifing Mechanisms.*

5.4.3.2. This process is repeated until the foundation has been raised to the height noted on the structural drawings. For example, it takes 18 passes to raise the foundation 6”.

Finish cap installed

5.4.4. Upon conclusion of the liG and the post-liG construction elevations are taken, adjustments as noted in 5.4 above to obtain a more level-like condition from OCE can be made again with the approval of the engineer of record and builder/client. Care must be taken to observe the slab during this process for any sign of cracking or distress. Deviation from OCE of ± 1/3” in any one location should not induce cracking or distress.



Cap void filled flush

5.4.5. Record the Final Construction Elevations (FCE) and ensure each bolt is hand-tightened to pier contact.

5.4.6. Install finish caps on the adjustable sleeve immediately aGer liG is completed, once final elevations are taken.

5.4.7. Fill in the void over the finish cap with ARDEX™ or similar concrete patch and smooth to flush with the top of the finished floor elevation.

5.4.8. Submit the recorded hammer test results and FCE readings to SlabTek.

5.5. Installation of Soil Retainer for Post-Installed Method

5.5.1. As mentioned earlier, a soil retainer can be installed post-slab liG if not done so during the slab make-up. It is recommended that form boards be properly set to ensure a straight-edge perimeter beam is provided which will make it easier to install the soil retainer without the typical “slag” obstructions that can occur.

5.5.2. The soil retainer is installed from the bottom of the concrete perimeter beam extending to the bottom of the beam soils.

5.5.3. The soil retainer shall be the minimum grade and thickness as prescribed by the manufacturer's specifications to effectively withstand deterioration and lateral soil pressures, as well as to maintain a positive moisture/rodent barrier between the void space and the perimeter soils.

Section 6. Acronyms

BC	Banded cables
DC	Distributed cables
EOR	Engineer of Record
IPC	International Plumbing Code
IRC	International Residential Code
MECH	LiGing Mechanism
OCE	Original construction elevation
PT	Post tension
PVR	Potential vertical rise
SC	Shrinkage cables

Section 7. Glossary

Banded cables (BC) - The set (or "band") of four post-tension cables are placed over each row of piers typically in the long pier span direction of the foundation. These cables are 'profiled' within the slab.

Beam cables - A single post-tension cable in all perimeter beams over 12'-0" in length

Capital - The (nominally) 26" square patch of extra slab thickness centered above each pier for purposes of strengthening the slab at the points of highest structural load concentration.

Cover - Minimum distance between a reinforcing element and the surface of the encasing concrete. Cover requirements vary depending on whether the concrete is in contact with water, soil, or air, and are enforced to limit degradation of the reinforcing element due to water intrusion through the concrete.

Distributed cables (DC1 and DC2) - The pair of post-tension cables that are placed over each column of piers are typically in the short pier span direction of the foundation placed. These cables are "profiled" within the slab.

Li†ing Mechanism (Mech) - The patented assembly placed atop each pier that allows the slab to be liGed. The Mech assembly consists of a steel bearing plate embedded in the top of the pier and an upper liGing device embedded in the slab.

Profiled cables - Post-tension cables whose elevation varies along the length of the cable. Profiling is done for increasing strength in reinforced concrete.

Shrinkage cables (SC) - A post-tension cable used to provide additional compression within the slab, to minimize shrinkage cracking. The SC cables run in between each row of piers typically in the short direction of the slab. SC cables are not profiled.