



Post-Tensioned Slab Foundations in Colorado:

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Introduction to Post Tension Slab-On-Grade Foundations



What is Post-Tensioning

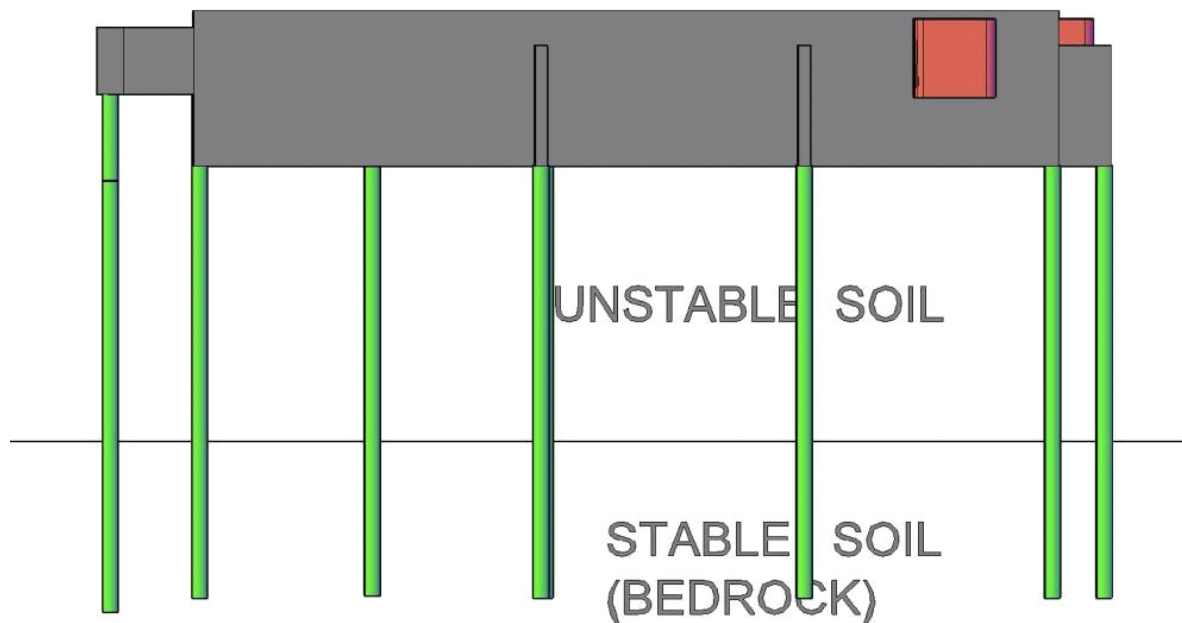


History And Objectives of the PTI method

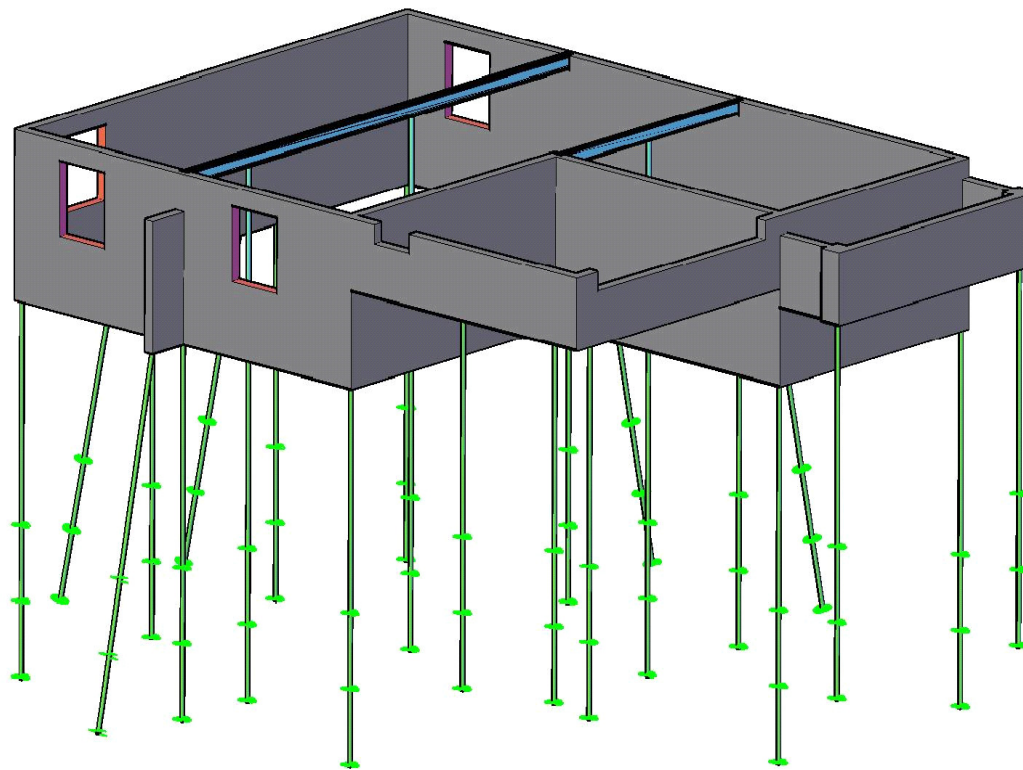


Foundation Options

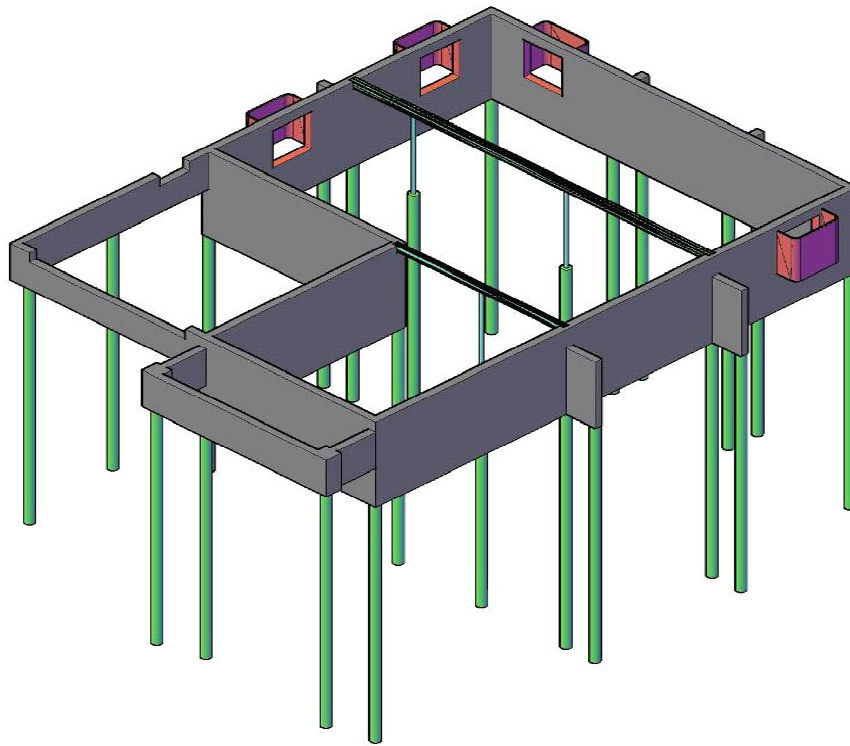
Deep Foundation Systems



Helical Piers or Screw Piles

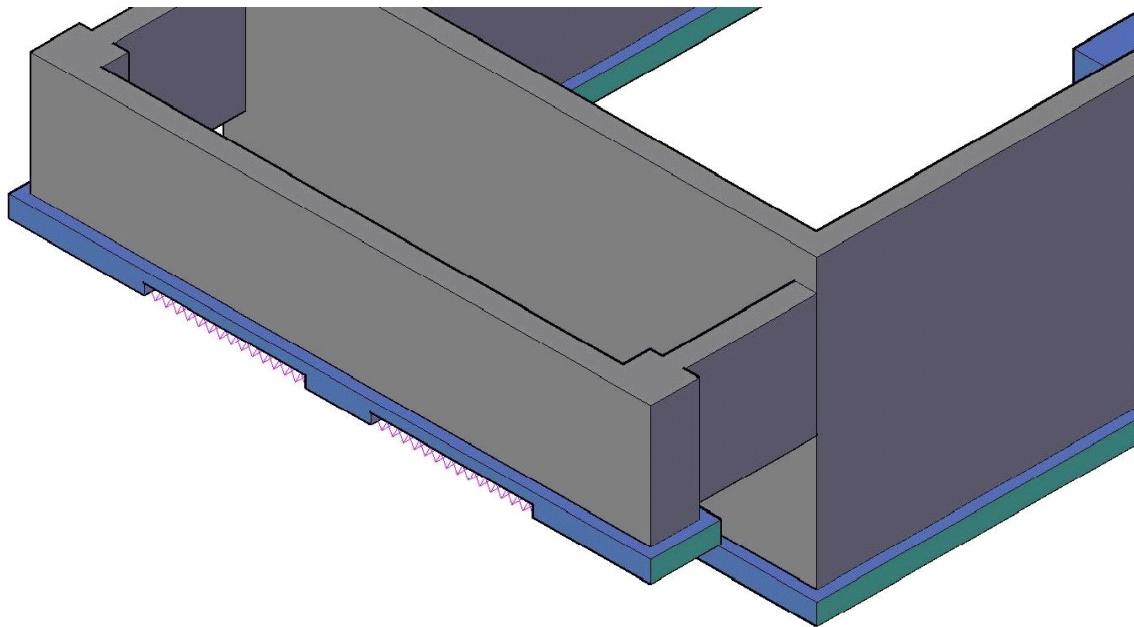


Straight Shaft Drilled Piers

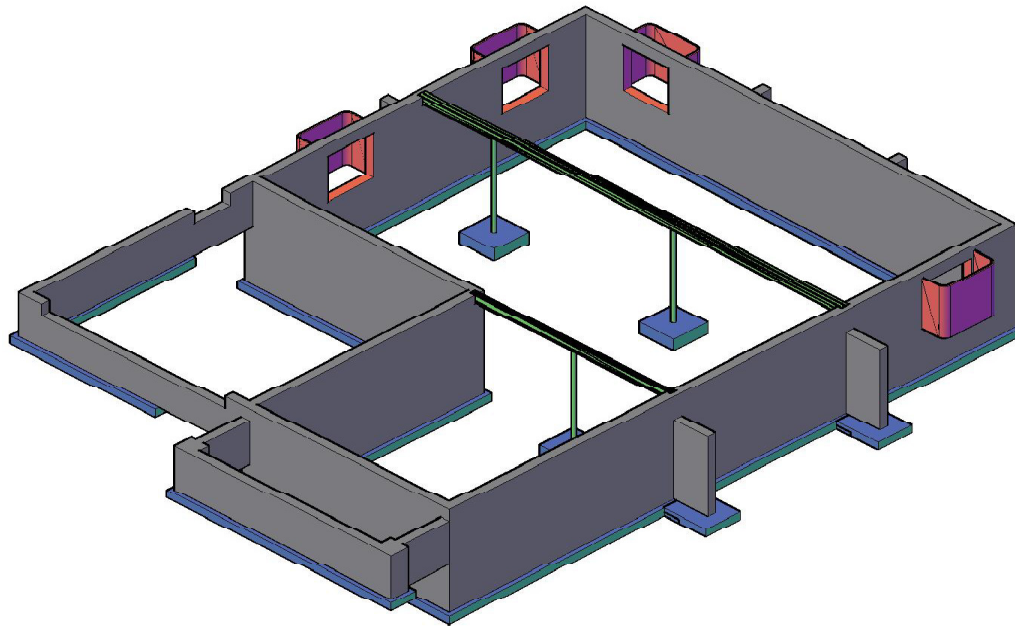


Shallow Foundation Systems

Spread Footing



Interrupted or Narrow Spread Footing





Why choose a Post Tensioned Foundation Slab-On-grade?

- Alternative to deep foundation systems if soils conditions are “moderate to high”
 - Drilled piers
 - Helical piers
- Improved slab performance over traditionally reinforced slab-on-grades
- Crack control
- Improved performance with less steel and concrete
- For Residential projects it will eliminate a wood floor at the ground floor
 - Typically reduces excavation costs



Design of a Post Tensioned Slab-On-grade

Determine if designing by 2nd or 3rd Edition

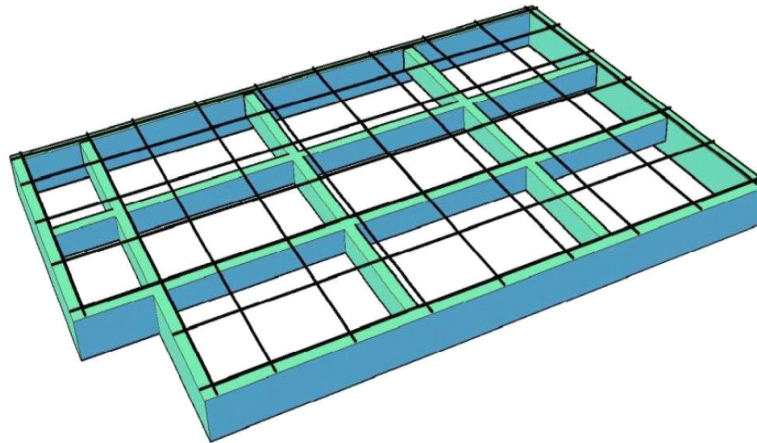
- *The design values are NOT the same*

Slab Foundation Systems

Slab foundations can be designed as:

- A thin slab (4" to 6") with ribs
- Uniform slab with no ribs

PT Slab with ribs





Required information prior to starting design

- Complete Geotechnical Report
 - Maximum Bearing Pressure
 - Edge Moisture Variation Distance, e_m
 - ◆ Edge lift and center lift
 - Differential Soil Movement, y_m
 - ◆ Edge lift and Center lift
- Loads from Structure
 - Gravity Loads
 - Uplift
- Stiffness Coefficient
 - Consider Drywall, Stucco, and Brick

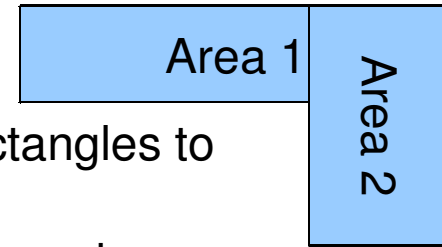


Design Basics for Post-Tensioned Slab-On-Grade Systems

- Consider soil movement in two ways
 - Center Lift
 - ◆ Center of building higher than edge
 - Edge Lift
 - ◆ Center of building lower than edge
- Strength in slab determined by the same basics as any other structural concrete member with the added benefit of compression from the cables.
- Stress diagram is shifted by 50 to 100psi towards compression.



Post-Tensioned Slab-On-Grade Design Utilizing the PTI Method



- Divide the foundation into overlapping rectangles to cover the entire foundation
- Each rectangle is designed to determine worst case
- Determine rib locations
 - Maximum spacing of 15ft
 - Locate at point loads & shear walls
- Preliminary design using software
 - PTISlab by GTK
 - RAMConcept by Bentley
 - ADAPT-SOG by ADAPT
 - Spreadsheet

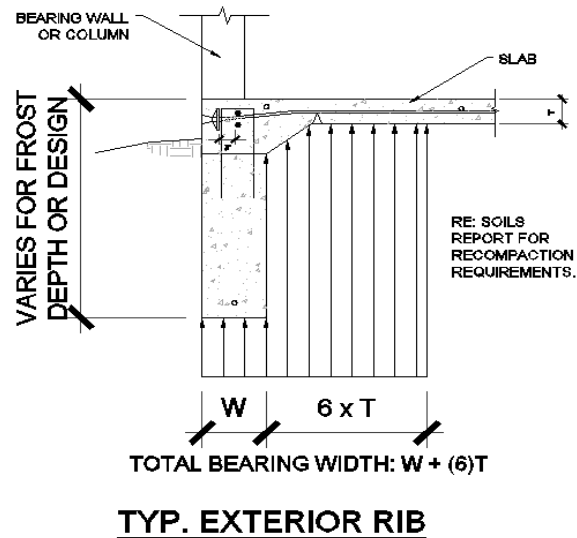
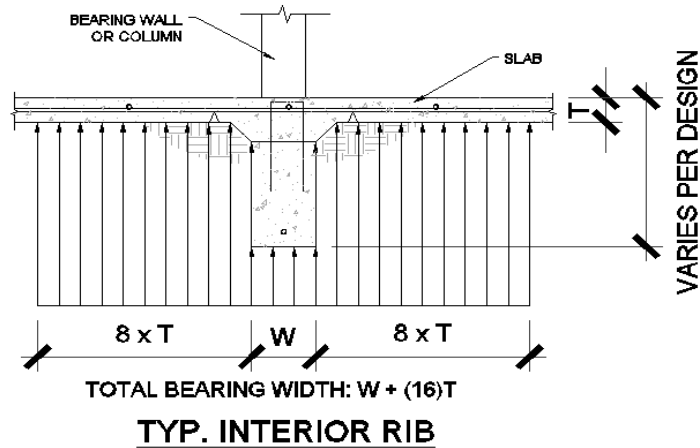
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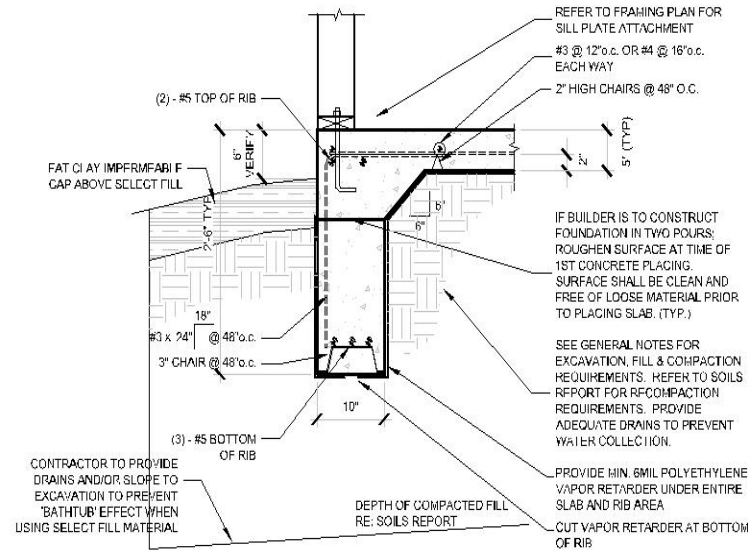
Continued...

- Design each rectangle area and then adjust rib depth, rib width, rib spacing, as needed to create a consistent design for all areas.
- Determine needed effective prestress.
 - 50psi minimum
 - 75 to 100psi to control cracking
- Typical widths of ribs are 10" to 14".
- Bearing area is not based solely on rib width.

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NO BRICK TYP. EXTERIOR RIB

A

SCALE: 3/4" = 1'-0"

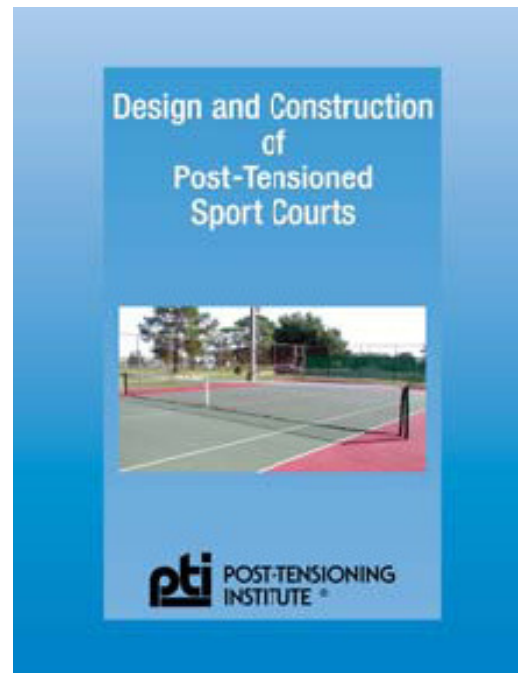
Post-Tensioned Slab-On-Grade Commercial and Industrial Floors

POST-TENSIONED
COMMERCIAL AND
INDUSTRIAL FLOORS

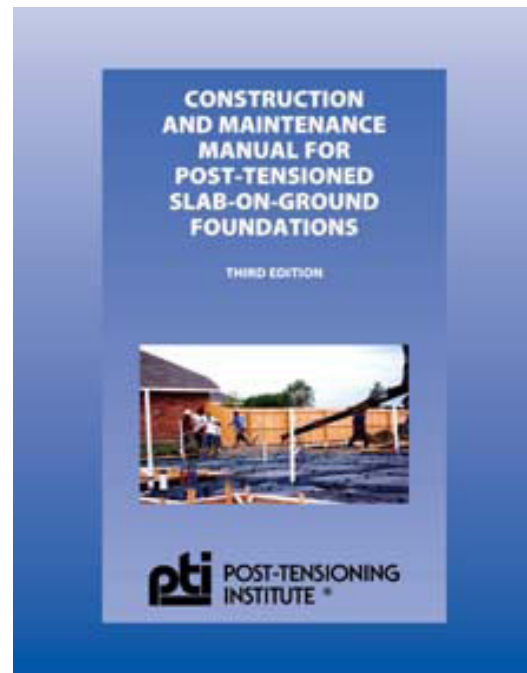
 POST-TENSIONING
INSTITUTE[®]



Design and Construction of Post-Tensioned Sport Courts



Construction and Maintenance Manual for Post-Tensioned Slab-On-Ground Foundations



Materials

- Concrete



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- Moisture barrier
 - Rules of thumb



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- Post-Tensioning reinforcement



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- Conventional reinforcement



Construction

- Site preparation, Drainage and Final Grading



Beams

- Beam trenching
- Beam reinforcement
- Beam Tendons or not
- Beam penetrations
- Beam concrete pour
 - Vibration



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Slabs

- Slab forming
- Slab reinforcement
- Slab penetrations
- Slab concrete pour
 - Vibration



Pre Concrete Pour Observation



Post concrete pour

- Stressing



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- Cracks



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- Repairs



Post Construction Issues

- Drywall cracks
- Concrete cracks



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- Some causes of damage
 - Improper site remediation
 - Improper site grading
 - Improper site drainage
 - Improper installation of landscaping
 - Structural design
 - Construction defects
 - ◆ Materials
 - ◆ Installation





Resources for Structural Engineers

