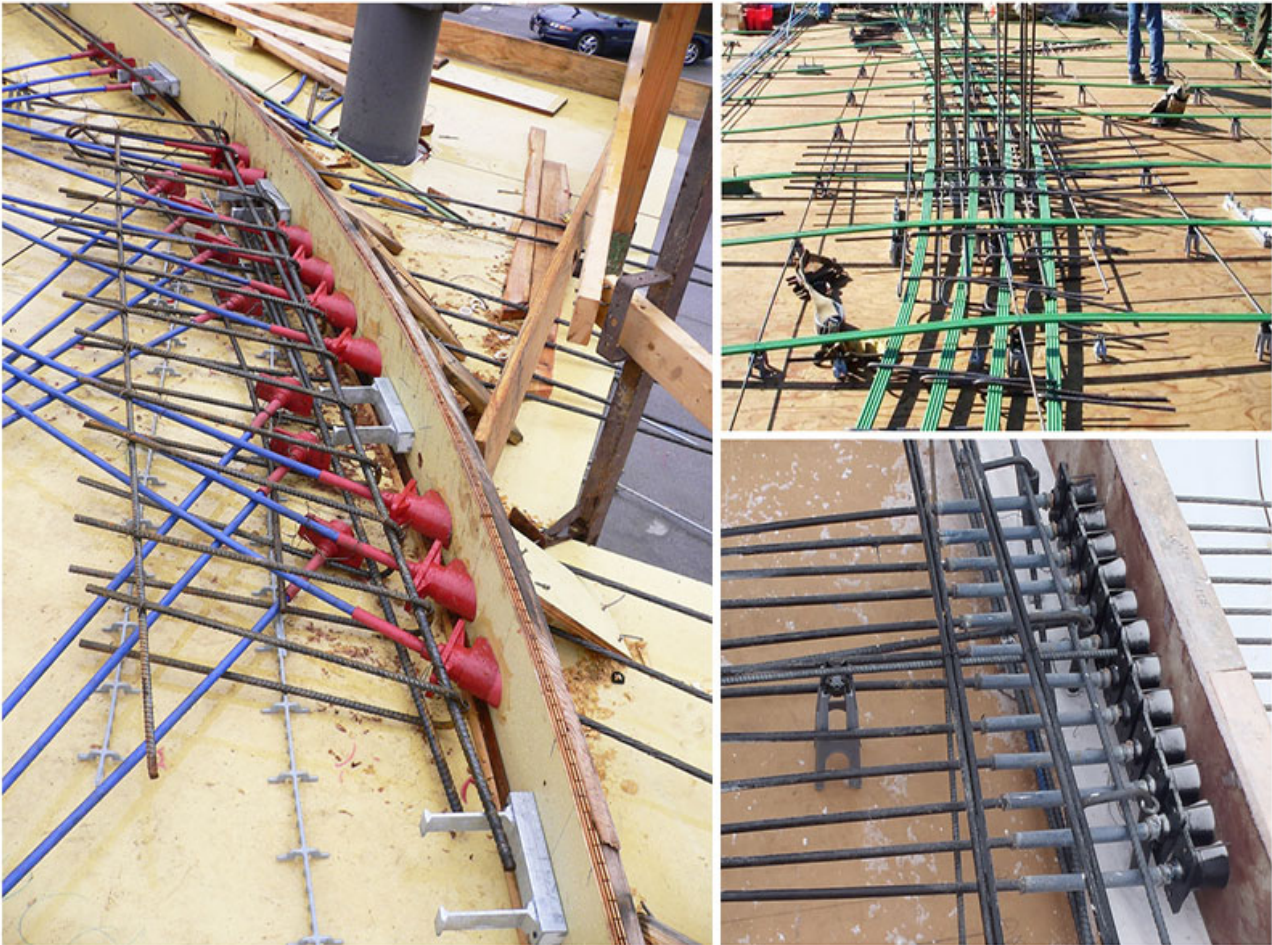


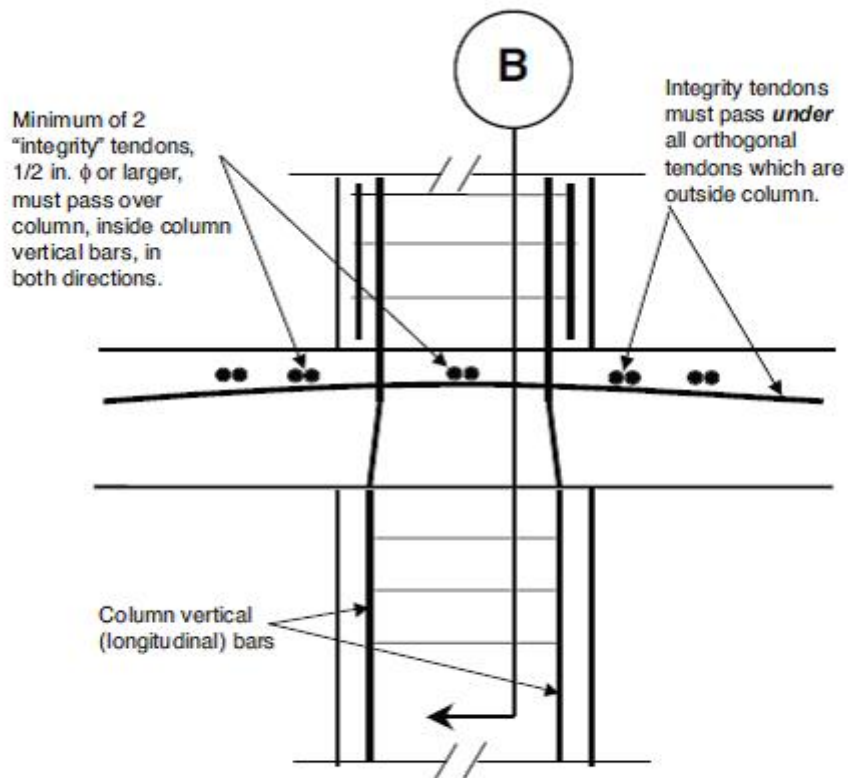
## Requirements of Strand through Column in Post Tension Floor



ACI318 is a code used as requirements for post tension floor design as well as design of steel reinforced concrete. Requirements of strand through column is discussed in chapter 18 Prestressed Concrete in section 18.12 Slab Systems. Section 18.12.4 states that “at least two strands must pass through the critical cross section above the column”. Up until ACI318 in 2005, the code did not specify strand size and they were permitted to be off the column as long as within critical cross section. However, ACI318 2008 issues additional requirements on floor system stating in section 18.12.6 and 18.12.7 as follows:

## Requirements of Strand through Column in Post Tension Floor

"18.12.6 In unbonded post tension floor system, at least two spiral steel strands for prestressed concrete of 12.7 mm in diameter or more must be placed or fastened in both directions of the column where it must be within the area surrounded by reinforced steel stand of columns. For external columns and areas in front of shear cap, both groups of strand must run under the perpendicular strands. The position of both strands must be fixed within the area is surrounded by reinforced steel stand of columns. Anchorage must be free from the center guide of the column."



*Figure 26-2A Section A at Slab/Column Joint  
(Cut Through Banded Tendons)*

## Requirements of Strand through Column in Post Tension Floor

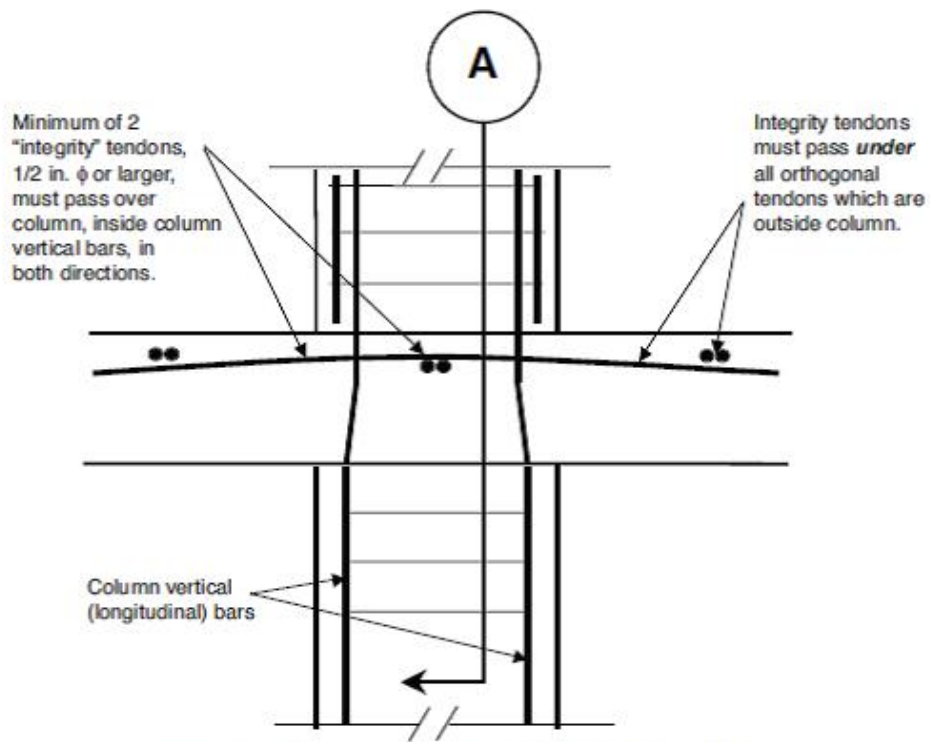
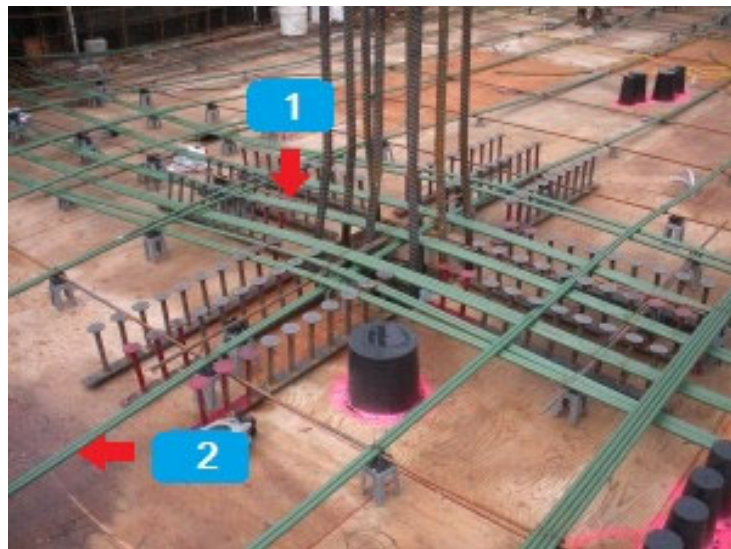


Figure 26-2B Section B at Slab/Column Joint  
(Cut Through Uniform Tendons)



1. At least two band-direction strands must pass through the column and once they pass through it, they must be under the strand in a perpendicular direction.
2. At least two uniform-direction strands must pass through the column and once they pass through it, they must be under the strand in a perpendicular direction.

## Requirements of Strand through Column in Post Tension Floor

“18.12.7 ในกรณีที่ไม่สามารถวางลวดตามที่กำหนดไว้ในหัวข้อ 18.12.6 ได้ จะต้องมึเหล็กเสริมล่างวางในพื้นที่ที่ล้อมรอบด้วยเหล็กเสริมยื่นของเสาทั้งสองทิศทางที่ตั้งฉากกัน โดยปริมาณเหล็กเสริมมีค่าเท่ากับ 1.5 เท่าของเหล็กเสริมต่ำสุดตามสมการที่ 10.3 ของ ACI CODE และจะต้องไม่น้อยกว่า 21BW/D/FY โดยที่ BW คือความกว้างของเสาที่เหล็กเสริมผ่าน ระยะยื่นของเหล็กเสริมจะต้องยื่นออกไปจากเสาไม่น้อยกว่าระยะฝังตามหัวข้อที่ 12.2.1 ของ ACI CODE”

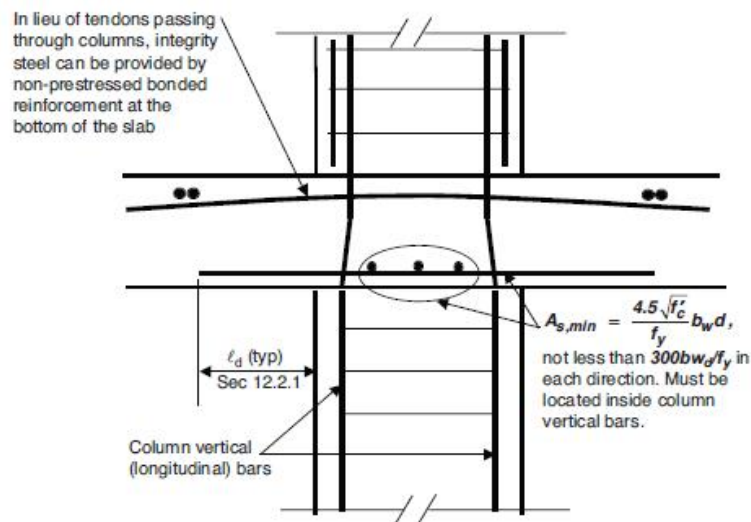


Figure 26-2C Section at Slab/Column Joint  
(Showing Application of 18.12.7)

$$A_{s,min} = \frac{0.8\sqrt{f'_c}}{f_y} b_w d \geq \frac{14}{f_y} b_w d$$

สมการที่10.3

### From Section 18.12.6

"18.12.7 In the case where the strand cannot be placed in accordance with section 18.12.6, lower steel reinforcement must be placed in an area surrounded by reinforced steel stand of columns in perpendicularly in both direction. The amount of reinforced steel is 1.5 times of the minimum steel reinforcement according to equation 10.3 of ACI CODE and it must not be less than 21BW/D/FY, where BW is the width of the reinforcing steel column that goes through the span range of reinforcing steel from the column which is no less than the embedding distance in accordance with section 12.2.1 of the ACI CODE.”

## Requirements of Strand through Column in Post Tension Floor

Strands would support the floor that is damaged from punching shear force in which it hangs the floor preventing it from falling down below.



- For bonded post tension floor system, there are two to five strands in one tendon within a corrugated flat sheath. It is difficult for the strands to go through a column. Therefore, in order to comply with the objectives of section 18.12.6, steel reinforcement must be added following section 18.12.7 instead.

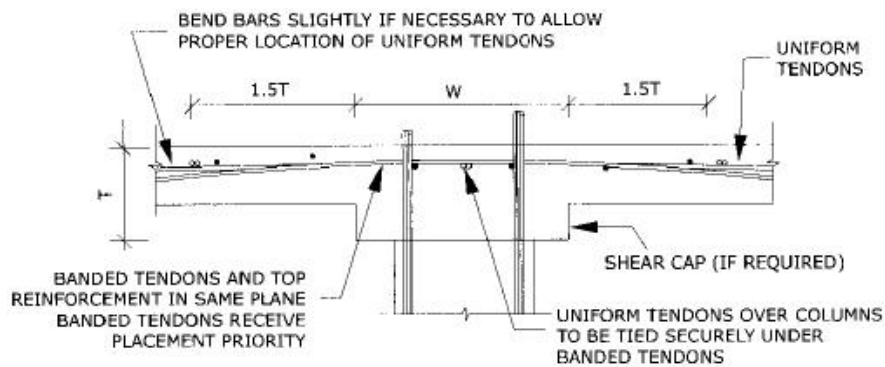
- In addition, if it is found that strands cannot go through the column and thus steel reinforcement following section 18.12.7 is chosen, the reinforcing steel must be in the same position as the reinforcement for progressive collapse which must be incorporated when designing beamless floor. In such area, it is also necessary to take into account collateral forces due to earthquake as well. It is wise to choose to add more steel reinforcement. A section on disaster prevention through steel reinforcement will be further discussed in the next occasion.

## Requirements of Strand through Column in Post Tension Floor

- The latest revision of ACI318, 2014 discusses about this as well. The content is consistent with ACI318 in 2008, details is available in section 8.7.5.6.

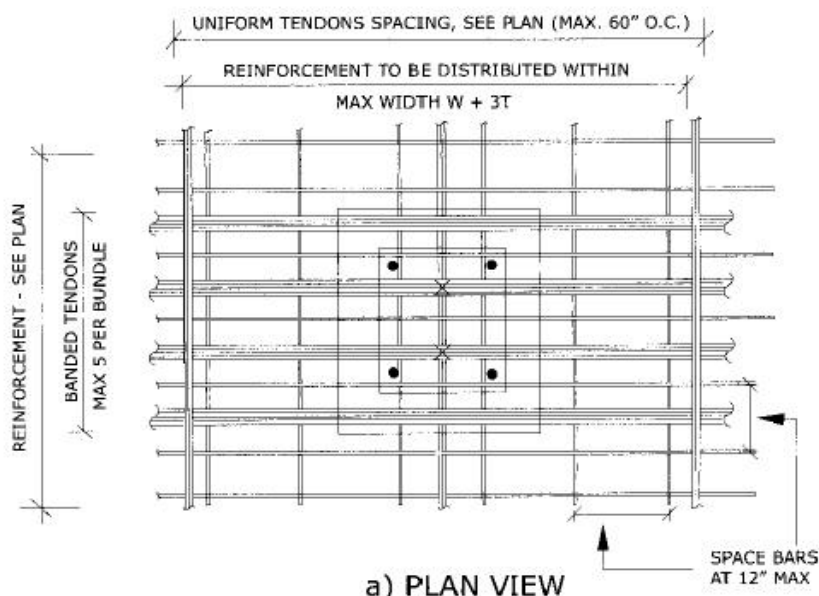
- Post-Tensioning Manual Sixth Edition, which corresponds with ACI318 in 2002, mentions about strand placement at column head in section 6.4.2.2 Tendons Over Column Supports for Two-Way Slabs, page 123, which uses bonded and unbonded beamless slabs as follows:

- "Alignment of steel reinforcement in band-direction and uniform-direction above the column must be made in easily comprehensible detail for operator. Adding steel reinforcement above the interior column can be done as shown in the picture.



b) SECTION

NOTE: MIN. TWO TENDONS MUST PASS DIRECTLY OVER COLUMNS EACH WAY



a) PLAN VIEW

## Requirements of Strand through Column in Post Tension Floor

### Compile By

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2. ACI COMMITTEE 318; “BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE (ACI 318-05) AND COMMENTARY”
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6. PTI POST-TENSIONING INSTITUE; “POST - TENSIONING MANUAL ” SIXTH EDITION