Axially loaded Column (IS: 456-2000 and SP: 16)

Rectangular/Square Column

- P = Axial load
- $P_u = 1.5*P$
- $P_u = (0.4*f_{ck}*A_c) + (0.67*f_y*A_{sc})$ (IS:456: Page-71)
- P_{safe}= Safe load = $P_u / 1.5$
- Assume, A_{sc} = 0.8% to 6% of $A_g = 0.008*A_g$ to $0.06*A_g$ (IS:456: page-48)
- $A_g = (A_{sc} + A_c)$
- Minimum Diameter of main reinforcement = 12 mm
- Minimum No. of main bars = 4 (Rectangular and Square)
- Minimum Cover of column = 40 mm
- Maximum distance between any two bars along the face = 300 mm
- <u>Lateral ties:</u> (IS:456: page-49)
- Pitch: (p): (1) Least lateral dimension

  (2) 16*Dia(Small) of main steel

  (3) 300 mm

  Find: Min. Value (1),(2),(3)>>> Max. Value of Pitch (p)
- Diameter:($Ø_{tr}$): (1) ¼*Dia (Large) of main steel

  (2) 6 mm

  Find: Max. Value (1), (2)>>>Min.Value of Diameter
- <u>Minimum eccentricity: (20 mm)</u> (IS:456: page-42)

  $e_{min} = (l/500 + D/30) < 0.05*D$ … (x-axis)

  $e_{min} = (l/500 + b/30) < 0.05*b$ … (y-axis)

Note: A_{sc}= Area of steel in compression

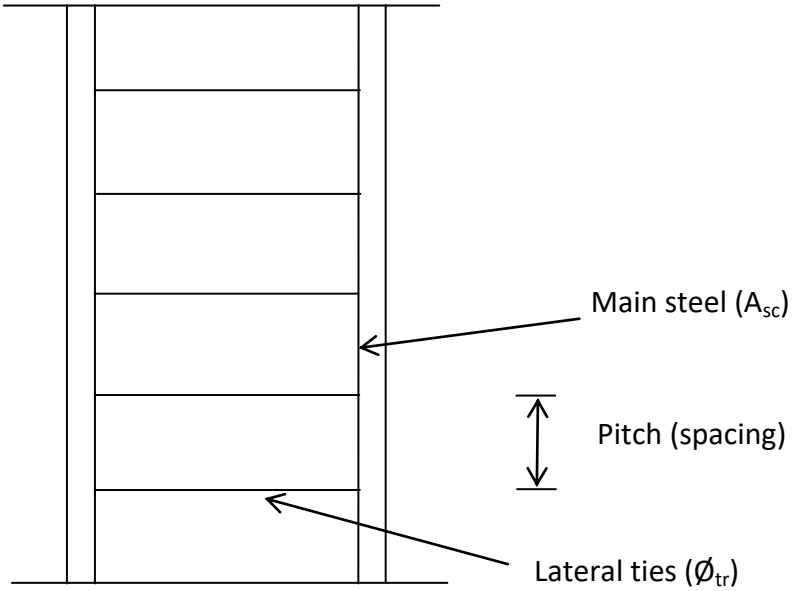
A_c = Area of concrete

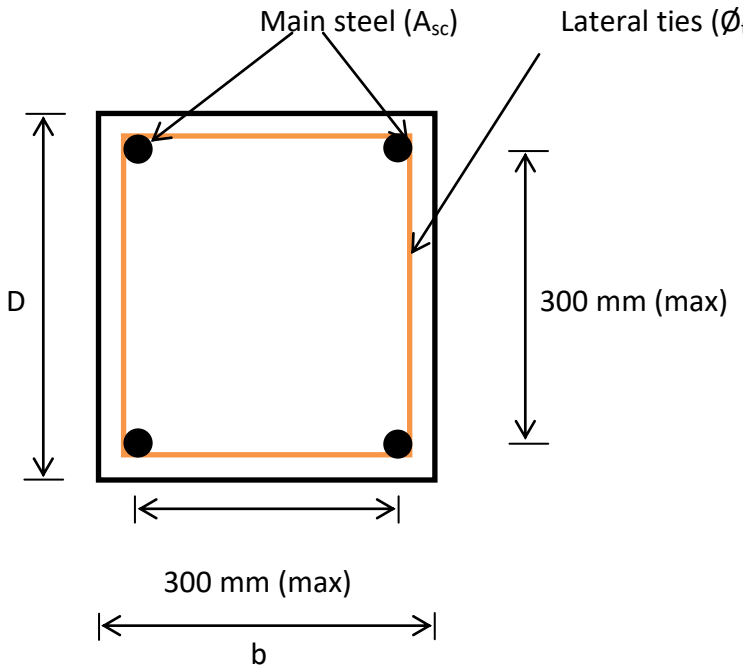
A_g = gross area = (b*D)

f_{ck} = characteristic strength of concrete (N/mm^2)

f_y = characteristic strength of steel (N/mm^2)

For finding Diameter (Ø) and No. of bars of main steel, Use SP:16-page 229.





Circular Column

- P = Axial load
- P_u = (1.5*P / 1.05)
- $P_u = (0.4*f_{ck}*A_c) + (0.67*f_y*A_{sc})$ (IS:456: Page-71)
- P_{safe}= Safe load = P_u / 1.5
- Assume, A_{sc} = 0.8% to 6% of A_g = $0.008*A_g$ to $0.06*A_g$ (IS:456: page-48)
- $A_g = (A_{sc} + A_c)$
- Minimum Diameter of main reinforcement = 12 mm
- Minimum No. of main bars = 6 (Circular)
- Minimum Cover of column = 40 mm
- Maximum distance between any two bars along the periphery = 300 mm
- <u>Helix (or) spiral:</u> (IS:456: page-49)
- Pitch: (p): (1) 75 mm (max)

  (2) 1/6 * D_c (max)

  (3) 25 mm (min)

  (4) $3*Ø_{sp}$ (min)

  Find:Min. Value (1), (2) & Max. Value (3), (4)

  Provide pitch (p) in between above values

- Diameter of spiral:($Ø_{sp}$): (1) ¼*Dia (Large) of main steel

  (2) 6 mm

  Find: Maximum value >>>Min.Value of Diameter($Ø_{sp}$)

- Calculation for pitch (p):

  $0.36*\{(A_g/A_{cr}) - 1\}* f_{ck}/f_y <= (4*a_{sp} / p*D_c)$... (IS: 456: page-71)

Note: D_c = Diameter of core = (D – 2*c)

c = cover

A_{cr}= Area of core = $(\pi/4)*D_c^2$

A_g = gross area =$(\pi/4)*D^2$

$a_{sp} = (\pi/4)*\emptyset_{sp}^2$

$\emptyset_{sp}$ = diameter of spiral

f_{ck} = characteristic strength of concrete (N/mm^2)

f_y = characteristic strength of steel (N/mm^2)

For finding Diameter (Ø) and No. of bars of main steel, Use SP:16-page 229.