

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)
- $P_{safe} = \text{Safe load} = P_u / 1.5$
- 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
- Lateral ties: (IS:456: page-49)
- Pitch: (p): (1) Least lateral dimension
(2) $16 * \text{Dia}(\text{Small})$ of main steel
(3) 300 mm
Find: Min. Value (1),(2),(3)>>> Max. Value of Pitch (p)
- Diameter: (ϕ_{tr}): (1) $\frac{1}{4} * \text{Dia}(\text{Large})$ of main steel
(2) 6 mm
Find: Max. Value (1), (2)>>>Min.Value of Diameter
- Minimum eccentricity: (20 mm) (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

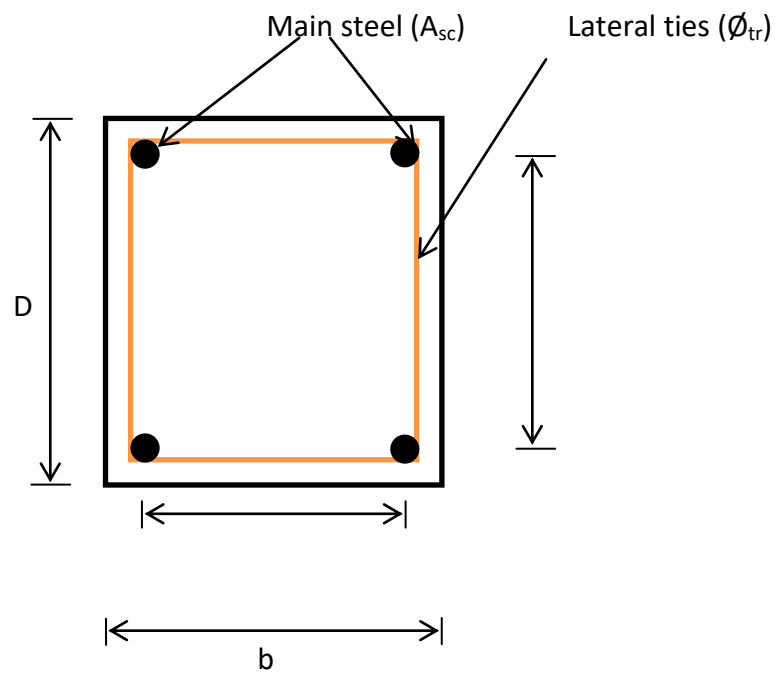
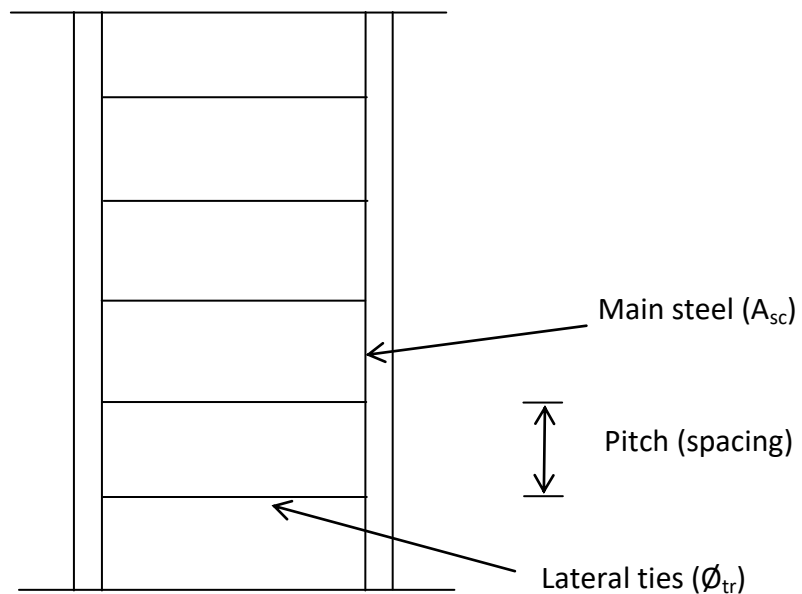
A_c = Area of concrete

A_g = gross area = $(b \cdot D)$

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

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

For finding Diameter (ϕ) 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)
- $P_{safe} = \text{Safe load} = P_u / 1.5$
- 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
- Helix (or) spiral: (IS:456: page-49)
- Pitch: (p): (1) 75 mm (max)
(2) $1/6 * D_c$ (max)
(3) 25 mm (min)
(4) $3 * \phi_{sp}$ (min)

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

Provide pitch (p) in between above values

- Diameter of spiral: (ϕ_{sp}): (1) $1/4 * \text{Dia (Large) of main steel}$
(2) 6 mm

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

- Calculation for pitch (p):

$$0.36 * \{(A_g / A_{cr}) - 1\} * f_{ck} / f_y \leq (4 * a_{sp} / p * D_c) \dots \quad (\text{IS: 456: page-71})$$

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

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

ϕ_{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 (ϕ) and No. of bars of main steel, Use SP:16-page 229.

