

23CE503:STRUCTURAL ENGINEERING - I (RCC)

Topic: Unit- IV : COLUMNS

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NARSIMHA REDDY ENGINEERING COLLEGE

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AXIALLY LOADED COLUMN



- ▶ **COLUMN**- if a compression member, **effective length $> 3 \times$ least lateral dimension is called Column.**
- ▶ Normally columns are subjected to axial compressive force, but sometimes it may be subject to to moments on one or both the axes.
- ▶ **STRENGTH OF COLUMNS DEPENDS UPON:**
 - ▶ Shape, size and cross section of column
 - ▶ Length

TYPES OF LOADING

AXIALLY LOADED COLUMNS

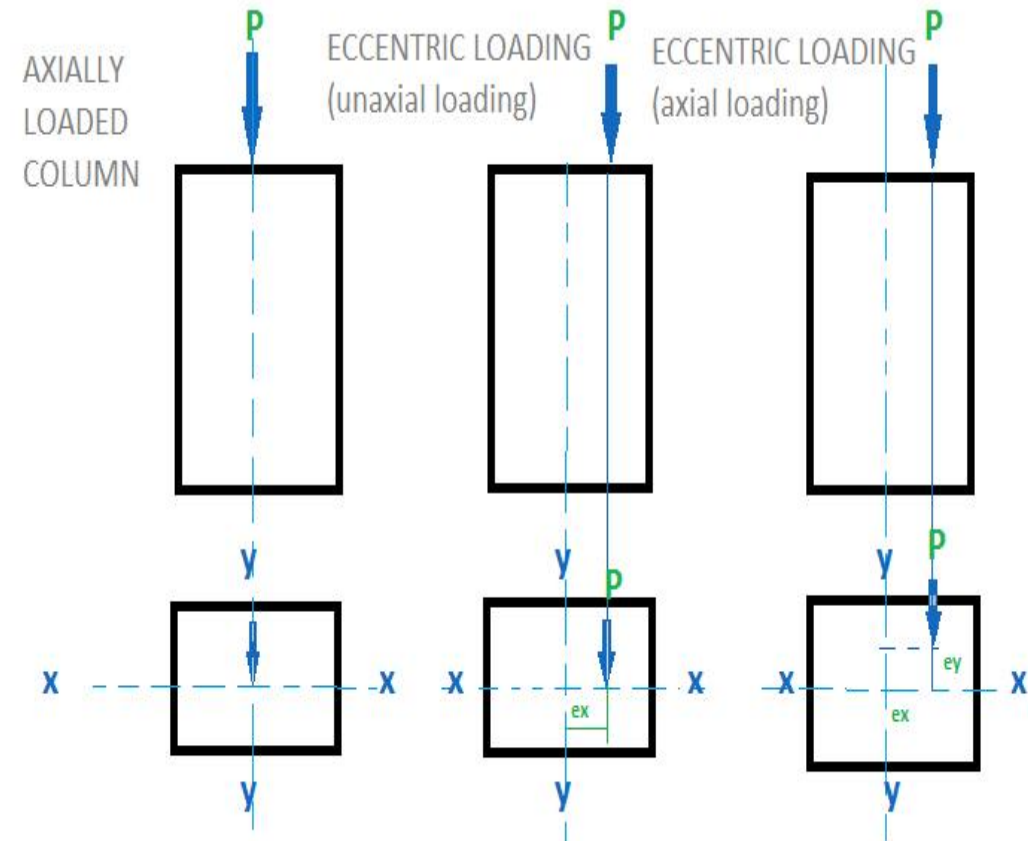
- ▶ Columns subjected to loads acting along the longitudinal axis or centroid of column section.

ECCENTRICALLY LOADED COLUMN (uniaxial loading)

- ▶ Loads which do not act on the longitudinal axis of the column section

ECCENTRICALLY LOADED COLUMNS (biaxial loading)

- ▶ If the eccentricity is with respect to both the axis (x and y axis) the column is said to be under biaxial loading.



▶ **FOR LATERAL TIES**

▶ the pitch of the lateral ties shall not be more than the least of the following:

▶ The least lateral dimension of the compression member

▶ **16 times diameter of the longitudinal bar**

▶ **300mm**

▶ **Diameter**

▶ The diameter of the lateral links or lateral ties shall not be less than

▶ **$\frac{1}{4}$ * diameter of the largest longitudinal bar**

▶ **6mm**

▶

HELICAL REINFORCEMENT

- ▶ **PITCH**- the pitch of helical reinforcement shall be:
- ▶ $\geq 75\text{mm}$
- ▶ $1/6^*$ core diameter of column
- ▶ But
- ▶ $\leq 25\text{mm}$
- ▶ 3^* diameter of helix
- ▶ **Diameter** :the diameter of helical reinforcement shall be,not less than:
- ▶ $1/4^*$ diameter of the largest longitudinal bar
- ▶ 6mm

MINIMUM ECCENTRICITY

- ▶ IS:456-2000,PG:42,CL.25,4
- ▶ All the column should be designed for minimum eccentricity
- ▶ **Minimum eccentricity(e)= unsupported length of column/500+Lateral dimension/30**
- ▶ **$e_{min} = L/500 + D/30$ where L and D are in mm**
- ▶ $e_{min} \geq 20\text{mm}$

ASSUMPTIONS IN DESIGN OF COMPRESSION MEMBER

- ▶ Plane section normal to the axis remain plane after bending
- ▶ Maximum strain in concrete at the outermost compression fibre is taken as 0.0035 in bending
- ▶ The maximum compressive strain in concrete in axial is taken as 0.002
- ▶ The tensile strength of concrete is ignored

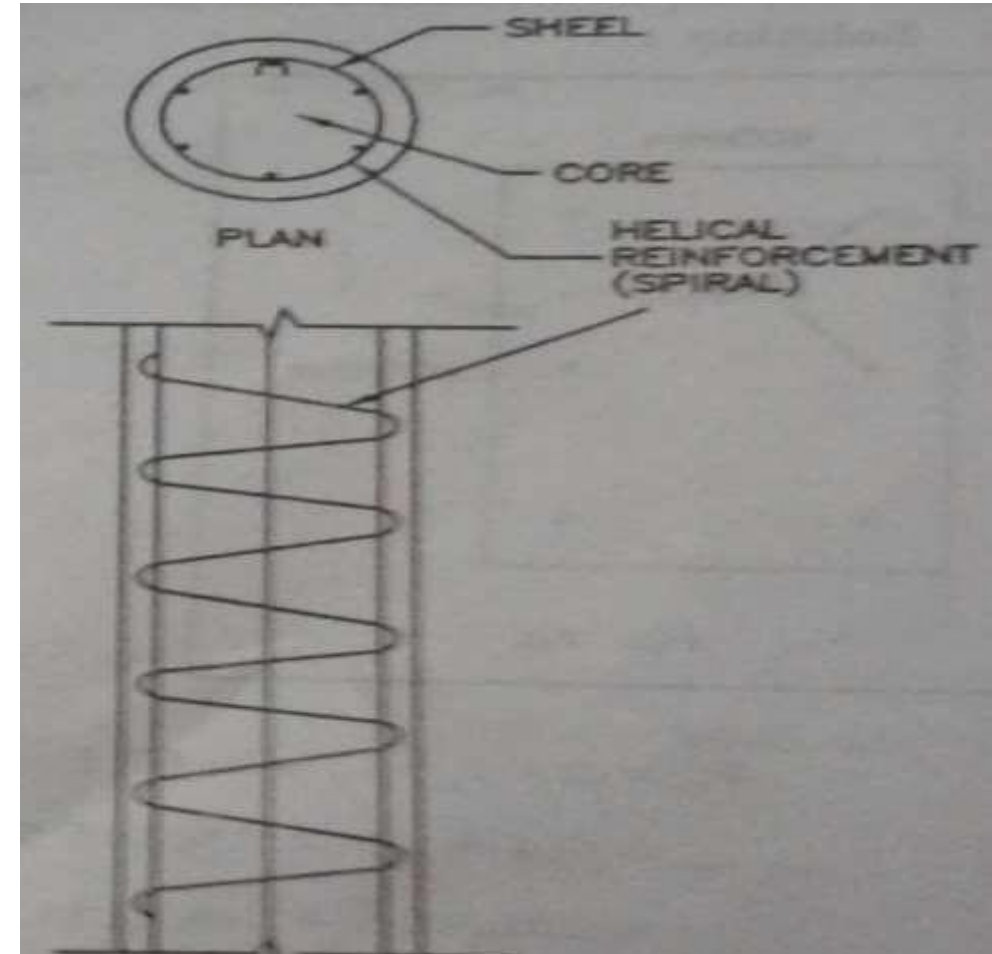
COLUMN WITH HELICAL REINFORCEMENT

- ▶ AS PER IS:456-2000, PG 71, CL.39.4
- ▶ **Strength of columns with helical reinforcement**
=1.05*strength of column with lateral ties
- ▶ **=factored load/1.05**
- ▶ Let A_{cr} =area of core A_g =gross area a_{sp} =area
of spiral(helical reinforcement

$$p_s = a_{sp}/A_{cr}$$

$$p_s = 0.36(A_g/A_{cr}-1)*f_{ck}/f_y$$

(IS:456-2000 PG.71)



Thank You..