

REVIEW MODULE - REINFORCED CONCRETE DESIGN (COLUMNS)



CIRCULAR SECTIONS

$$r = \sqrt{\frac{I}{A}}$$

$$P_u = 1.4 P_{DL} + 1.7 P_{LL}$$

NSCP 404

$$r = \sqrt{\frac{\frac{\pi}{4} D^4}{\frac{\pi}{4} D^2}}$$

where:

P_u = final factored load.

P_{DL} = dead axial load.

P_{LL} = live axial load.

$$r = \sqrt{\frac{D^2}{16}}$$

* NOTE:

1. FOR DIMENSIONS OF COLUMN, ROUND UP.

2. FOR NUMBER OF STEEL BARS, ROUND UP.

$$r = \frac{D}{4} \leq 0.25D$$

$$r \geq 0.25D$$

→ NSCP

3. FOR SPACING OF BARS, ROUND DOWN.

COLUMNS

ULTIMATE STRENGTH DESIGN

NSCP PROVISIONS

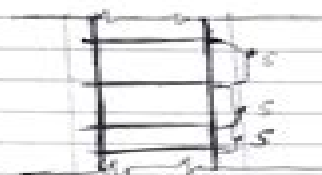
I. SHORT COLUMNS (Axially Loaded Columns)

$$a. \frac{KL_u}{r} \leq 40 - 12 \frac{M_1}{M_2} \quad b_{\text{eff}} \leq b_{\text{min}}$$

II. LONG COLUMNS (Eccentrically Loaded Columns)

$$a. \frac{KL_u}{r} > 40 - 12 \frac{M_1}{M_2} \quad b_{\text{eff}} > b_{\text{min}}$$

SHORT TIED COLUMNS



Min. concrete cover = 40mm

Min. steel cover = 45mm

* NOTE:

1. Design for

axial strength and ultimate load, P_u .

Tied Columns and Spiral Columns

* NOTE:

1. 10 max $\phi \leq 12$
2. 12 max $\phi \geq 12$

(ties) 8 8 8 8

(spiral) 8 8

Without End-Moments

$$\frac{KL_u}{r} \leq 22$$

Eccentrically Loaded Column

$$\frac{KL_u}{r} > 22$$

where:

K = effective length factor.

L_u = unbraced / unsupported length.

r = radius of gyration.

$$r = \sqrt{\frac{I}{A}}$$

RECTANGULAR SECTIONS

$$I = \frac{hb^3}{12} \quad ; \quad A = hb$$

h = larger dimension.

b = smaller dimension.

$$r = \sqrt{\frac{Kh^3/12}{Kh}}$$

$$r = \sqrt{\frac{b^2}{12}}$$

$$r = b \sqrt{\frac{1}{12}} \quad r \leq 0.25b$$

$$r = 0.3b \rightarrow \text{NSCP}$$

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