

▪ **Lay out and concrete dimension**

$$b = 25 \text{ cm}$$

$$t = 25 \text{ cm}$$

$$H_o = 6.47 \text{ m}$$

▪ **Load**

$$P_u = 18 \text{ ton}$$

▪ **Design**

Column is unbraced column

Upper case → partially fixed

Lower case → partially fixed

$$\therefore K = 1.5 \quad \text{from ECP 202 table 6 – 10}$$

$$\lambda_b = \frac{6.47 * 1.5}{.25} = 38.82 > 23 \text{ unsafe buckling}$$

Increase columns dimension

Try 1

Assume

$$b = 45 \text{ cm}$$

$$t = 45 \text{ cm}$$

$$\lambda_b = \frac{6.47 * 1.5}{.45} = 21.56 < 23 \text{ safe}$$

Calculation of additional moment

$$\sigma = \frac{\lambda_b^2 * b}{2000}$$

$$\sigma = \frac{21.56^2 * .45}{2000} = .10465$$

$$M_{add} = P * \sigma$$

$$M_{add} = 6.6 * .10465 = .690 \text{ t.m}$$

Design section under M, N

$$\frac{P_u}{f_{cu} * b * t}$$

$$\frac{6.6 * 10^3}{300 * 45 * 45} = .010 < .04 \text{ neglect } N$$

Design M only

Moment on column is very small value > used minimum reinforcement for this column

$$\frac{.6}{100} = \frac{A_{s-min}}{45 * 45}$$

$$A_{s-min} = 12.15 \text{ cm}^2 \gg 12\phi 12$$

Stirrup

$$\phi_s = .8 \text{ cm}$$

$$\phi_s = .25 * 1.2 = .3 \text{ cm}$$

$$\phi_s = 8 \text{ mm}$$

$$S = 20 \text{ cm}$$

$$S = 15 * 1.2 = 18 \text{ cm}$$

$$S = 20 \text{ cm}$$

Used Stirrup 5 ϕ 8/m

