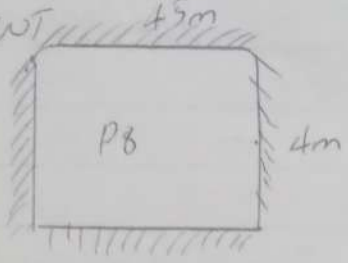
EBONGA VICTORY UNCONI

17/SCI14/009

ASSIGNMENT



Captab clapping = 1.2m

Concrete grade = 25-40N/mm²

Slab thickness = 250mm

Finishes = 1.2kN/m²

Partitions = 1.0kN/m²

slab: 0.25×25 = 6.25 ≈ 6kN/m²

Total = 8.2kN/m²

Factory design = 5.0

Area = 4×4.5 = 18m²

Design load = 1.4Gk + 1.6Qk

= (1.4×8²×18) + (1.6×5×18)

= 206.64 + 14.4

= 350.64

Short span

Span = lx - 2/3h = 4 - 2/3 × 1.2 = 3200mm

Moment = 45% × 0.071 fl = 45/100 × 0.071 × 350.64 × 4 = 44.81kN/m²

width, b = lx/2 = 4/2 = 2 = 2000mm

d-h-cover-½Q = 250-25-6 = 219mm

$k = M/bd^2 f_{cu} = \frac{44.81 \times 10^6}{2000 \times 219^2 \times 25} = 0.018$

$z = 0.9 + \sqrt{0.25 - k/0.9} = 0.5 + \sqrt{0.25 - 0.018}/0.9 = 0.987$

$= 0.95$

$Z = I_{ad} = 0.95 \times 219 = 208.05mm$

$A_s = \frac{M}{0.95 f_y Z} = \frac{44.81 \times 10^6}{0.95 \times 410 \times 208.05} = 542.97 mm^2$

Provide y12 @

Support

$M_2 = 25\% \times 0.071 h = \frac{25}{100} \times 0.071 \times 350.64 \times 4 = 24.91 kN/m^2$

$w = 2000m$

$k = \frac{24.9 \times 10^6}{2000 \times 217^2 \times 25} = 0.01$

$f_a = 0.5 + \sqrt{0.25 - \frac{0.01}{0.9}} = 0.99 > 0.95$

$= 0.95$

$Z = 0.95 \times 219 = 208.05mm$

$A_s = \frac{24.7 \times 10^6}{0.95 \times 410 \times 208.05} = 307.27 mm^2$

Provide Y12 @ 377mm

Column strip (span)

Span = 3200mm $h = 2000mm$

$M = 55\%$ of $0.71 fL = \frac{55}{100} \times 0.071 \times 350.64 \times 4 = 54.78 kN/m^2$

$k = \frac{54.78 \times 10^6}{2000 \times 219^2 \times 25} = 0.023$

$l_a = 0.9 + \sqrt{\frac{0.25 - 0.025}{0.9}} = 0.97 > 0.95$

$= 0.95$

$Z = 0.95 \times 219 = 208.05mm$

$A_s = \frac{54.78 \times 10^6}{410 \times 0.95 \times 208.05} = 676 mm^2$

Provide y16 @

Support

$M = \frac{75}{100} \times 0.071 \times 350.64 \times 4 = 74.69 kN/m^2$

$k = \frac{74.69 \times 10^6}{2000 \times 219^2 \times 25} = 0.03$

$I_q = 0.5 + \sqrt{0.25 - \frac{0.03}{0.9}} = 0.97 > 0.95$

$= 0.95$

$Z = 0.95 \times 219 = 208.05mm$

$A_s = \frac{74.69 \times 10^6}{410 \times 208.05 \times 0.95} = 921.7mm^2$

Provide Y12 @ 1130mm

Long SPAN: ($L_b = 2500$)

$Span = L_y - \frac{2}{3}h = 4.5 - \frac{2}{3} \times 1.2 = 3700mm$

$Moment = 0.45 \times 0.071 \times 350.64 \times 4.5 = 50.41 kN/m^2$

$k = \frac{50.41 \times 10^6}{2500 \times 219^2 \times 25} = 0.01$

$I_q = 0.5 + \sqrt{0.25 - \frac{0.01}{0.9}} = 0.99 > 0.95 = 0.95$

$Z = 0.95 \times 219 = 205.05mm$

$A_s = \frac{50.41 \times 10^6}{410 \times 208.05 \times 0.9} = 622.07mm^2$

Provide Y12 @ 646mm

Support

$M = 0.25 \times 0.071 \times 350.64 \times 4.5 = 28 kN/m^2$

$k = \frac{28 \times 10^6}{2500 \times 219^2 \times 25} = 9.34 \times 10^{-3}$

$I_q = 0.5 + \sqrt{0.25 - \frac{9.34 \times 10^{-3}}{0.9}} = 0.99 > 0.95$

$= 0.95$

$Z = 0.95 \times 219 = 208.05mm$

$A_s = \frac{28 \times 10^6}{410 \times 0.95 \times 208.05} = 345.53mm^2$

Provide Y12 @ 377mm

Column Strip

$Span = 3700mm$

$b = L_{(x)}/2 = 2000mm$

$Moment = 0.93 \times 0.071 \times 350.64 \times 4.5 = 61.61 kN/m^2$

$$k = \frac{61.61 \times 10^6}{2000 \times 219^2 \times 25} = 0026$$

$$I_a = 0.5 + \sqrt{\frac{0.25 - 0.026}{0.9}} = 0.97 > 0.95$$

$$= 0.95$$

$$Z = 0.95 \times 219 = 208.05mm$$

$$A_s = \frac{61.61 \times 10^6}{410 \times 0.95 \times 208.05} = 760.28mm^2$$

Provide Y12 @ 905mm

Support

$$\text{Moment} = 0.75 \times 0.071 \times 350 \times 4.5 = 84.02 kNm^{-2}$$

$$k = \frac{84.02 \times 10^6}{2000 \times 219^2 \times 25} = 0.035$$

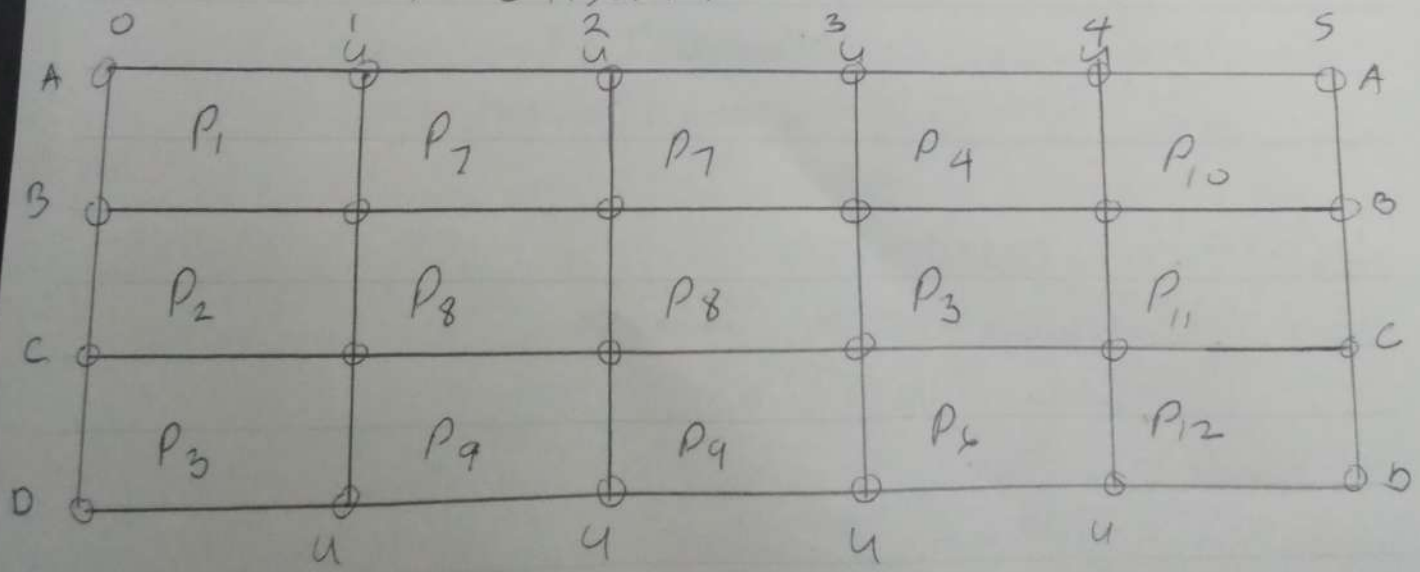
$$I_a = 0.5 + \sqrt{\frac{0.25 - 0.035}{0.9}} = 0.96 > 0.95$$

$$= 0.95$$

$$Z = 095 \times 219 = 208.05mm$$

$$A_s = \frac{84.02 \times 10^6}{0.95 \times 208.05 \times 410} = 1037.2mm^2$$

Provide Y12 @ 1130mm

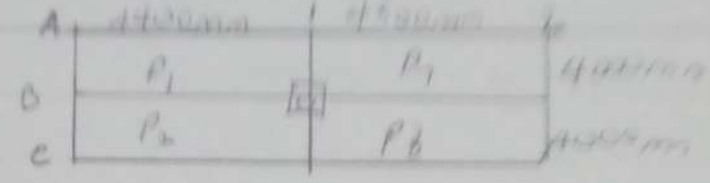


key = A = Axially

B = Biaxially

C = Uniaxially

Design of column B1



A = 4.4 · 4 = 17.6m²

Slab load

wt of slab = 0.15 x 24 = 3.6 kN/m²

finishes = 1.2 kN/m²

Partitions = 1.0 kN/m²

total = 5.8 kN/m²

Design load = 1.4 Gk + 1.6 Qk

= (1.4 x 5.8) + (1.6 x 2.3)

= 12.12 kN/m²

Beam load

wt of beam = 0.025 x 0.6 x 24 = 3.24 kN/m²

wall load = 3.47 x 3 = 10.41 kN/m²

13.65 kN/m²

Design load = 1.4 x 13.65 = 19.11 kN/m²

Design

Roof of 3rd floor

Roof load = Area x 1.5 x 1.5

= 17.6 x 1.5 x 1.5 = 39.6 kN

Roof beam = 0.825 x 0.45 x 24 = 2.43 kN/m²

finishes = 1.0 kN/m² / 3.43 kN/m²

Roof beam = 3.43 (4+2) n 1.4

Column load = 10 kN

Total load = 89.94 kN