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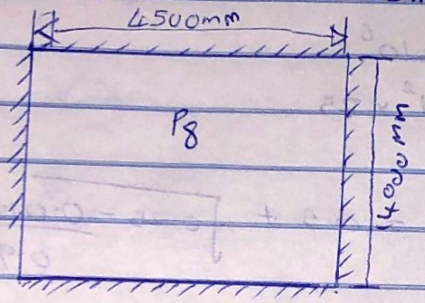
17/ENG03/010
Civil Engr
CVE 308

Assignment III

1) Capital / droppings = 1.2 in diameter
F_{cu} = 25N/mm²
F_y = 410N/mm²
Slab Thickness = 250mm = 0.25m



Weight of Slab = 0.25 × 24 = 6KN/m²
Finishes = 1.2 KN/m²
Partition = 1.0 KN/m²
Total = 9.2KN/m²

assuming Q.K = 5.0
D.L = 14GK + 1.6QK
= [(1.4 × 8.2) + (4.5 × 4)] + [(1.6 × 5.0) × (4.5 × 4)]
= 206.64 + 144
= 350.64KN

Short Span
middle Strip

Span: Effective Span = $C_x - \frac{2}{3}n$
= $4 - \frac{2}{3} \times 1.2$
= 3.2m = 3200mm

moment$_2$ = 4.5% × 0.071 FL

$= \frac{45}{100} \times 0.071 \times 350.64 \times 4$

$= 44.81$

width $= \frac{l_x}{2} = \frac{4}{2}$

$= 2m = 2000mm$

$d = h - \text{Cover} - \frac{1}{2}\phi$

$= 250 - 25 - \frac{1}{2} \times 1.2$

$= 219mm$

$K = \frac{M_1}{bd^2 f_{cu}} = \frac{44.81 \times 10^6}{2000 \times 219^2 \times 25}$

$= 0.0186$

$I_a = 0.5 + \sqrt{0.25 - \frac{K}{0.9}} = 0.5 + \sqrt{0.25 - \frac{0.0186}{0.9}}$

$= 0.978 (\geq 0.95)$

$Z = I_a d = 0.95 \times 219$

$= 208.05mm$

$A_s = \frac{M_1}{0.95 f_y Z} = \frac{44.81 \times 10^6}{0.95 \times 410 \times 208.05}$

$= 552.9mm^2$

Provide Y12 @ 200 c/c ($A = 566m^2$)

(b) Support: Moment, m_2 = 25% - 0.071 FL

$= \frac{25}{100} \times 0.071 \times 350.64 \times 4$

$= 24.9$

width, b = 2000mm

d = 219mm

$K = \frac{m_2}{bd^2 f_{cu}} = \frac{24.9 \times 10^6}{2000 \times 219^2 \times 26} = 0.0104$

$$I_a = 0.5 + \sqrt{0.25 - \frac{K}{0.9}} = 0.5 + \sqrt{0.25 - \frac{0.0104}{0.9}}$$

$$= 0.988 \ (\geq 0.95)$$

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

$$= 208.05mm$$

$$A_s = \frac{M_2}{0.95 f_y Z} = \frac{24.9 \times 10^6}{0.95 \times 410 \times 208.05}$$

$$= 307.2mm^2$$

Provide Y12 @ 300 c/c ($A = 377m^2$)

Column design

Span. Effective Span $= (x - \frac{2}{3}a = 4 - \frac{2}{3} \times 1.2$

$$= 3200m$$

$$width = \frac{Cx}{2} = \frac{4000}{2}$$

$$= 2000mm$$

moment, $M_2 = 55\% \times 0.071FL = \frac{55}{100} \times 0.071 \times 350.64 \times 4$

$$= 54.77$$

$$K = \frac{M_2}{bd^2 F_{cu}} = \frac{54.77 \times 10^6}{2000 \times 219^2 \times 35}$$

$$= 0.023$$

$$I_a = 0.5 + \sqrt{0.25 - \frac{K}{0.9}} = 0.5 + \sqrt{0.25 - \frac{0.023}{0.9}}$$

$$= 0.97 (\geq 0.95)$$

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

$$= 208.05 mm$$

$$A_s = \frac{m_2}{0.95 f_{yz}} = \frac{54.77 \times 10^6}{0.95 \times 410 \times 208.05}$$

$$= 675.87 mm^2$$

Provide Y12 @ 150 c/c ($A = 754 mm^2$)

(b) Support: $m_2 = 75\% \times 0.071 f_{cu} = \frac{75}{100} \times 0.071 \times 356.64 \times 14$

$$= 74.7$$

Width = 2000mm

$$K = \frac{m_2}{b d^2 f_{cu}} = \frac{74.7 \times 10^6}{2000 \times 219^2 \times 25}$$

$$= 0.0311$$

$$I_a = 0.5 + \sqrt{0.25 - \frac{K}{0.9}} = 0.5 + \sqrt{0.25 - \frac{0.0311}{0.9}}$$

$$= 0.96 (\geq 0.95)$$

$$Z = I_a d = 0.95 \times 219$$

$$= 208.05 mm$$

$$A_s = \frac{m_2}{0.95 f_{yz}} = \frac{74.7 \times 10^6}{0.95 \times 410 \times 208.05}$$

$$= 921.82 mm^2$$

Provide Y12 @ 100 c/c ($A = 1130 mm^2$)

Long Span

Middle Strip

Span: Effective Span $= C_y - \frac{2}{3} h = 4.5 - \frac{2}{3} \times 1.2$

$= 3.7m = 3700mm$

· Width, $b = l_y - \frac{l_x}{2} = 4.5 - \frac{4}{2}$

$= 2.5m = 2500mm$

· Moment, $m_1 = 45\% \times 0.071FL$

$= \frac{45}{100} \times 0.071 \times 350.64 \times 45$

$= 50.41$

$d = 219mm$

$K = \frac{m_1}{bd^2 f_{cu}} = \frac{50.41 \times 10^6}{2500 \times 219^2 \times 25}$

$= 0.017$

$I_a = 0.5 + \sqrt{0.25 - \frac{K}{0.9}} = 0.5 + \sqrt{0.25 - \frac{0.017}{0.9}}$

$= 0.98 \ (\geq 0.95)$

$Z = l_a d = 0.95 \times 219$

$= 208.05mm$

$A_s = \frac{M_1}{0.95 f_y Z} = \frac{50.41 \times 10^6}{0.95 \times 410 \times 208.05}$

$= 622.07mm^2$

Provide Y12 @ 175 c/c ($A = 646mm^2$)

· Support: Moment, $M_2 = 25\% \cdot 0.071FL$

$= \frac{25}{100} \times 0.071 \times 350.64 \times 4.5$

$= 28.01$

· Width, $b = 2500mm$

· $d = 219mm$

$$K = \frac{M_2}{bd^2 f_{cu}} = \frac{28.01 \times 10^6}{2500 \times 219^2 \times 25}$$

$$= 0.0093$$

$$Ia = 0.5 + \sqrt{0.25 - \frac{K}{0.9}} = 0.5 + \sqrt{0.25 - \frac{0.0093}{0.9}}$$

$$= 0.99 \ (\geq 0.95)$$

$$Z = Iad = 0.95 \times 219$$

$$= 208.05mm$$

$$A_s = \frac{M_2}{0.95 f_y Z} = \frac{28.01 \times 10^6}{0.95 \times 410 \times}$$

$$= 345.7 mm^2$$

Provide Y12 @ 300 c/c ($A = 377mm^2$)

② Column Strip

@ Span: · Effective Span = 3700mm

· width $= \frac{l_x}{2} = \frac{4}{2}$

$= 2m = 2000mm$

· Moment $M_1 = 55\% \times 0.071FL$

$= \frac{55}{100} \times 0.071 \times 350.64 \times 4.5$

$= 61.62$

$$K = \frac{M_1}{bd^2 f_{cu}} = \frac{61.62 \times 10^6}{2000 \times 219^2 \times 25} = 0.025$$

$$I_a = 0.5 + \sqrt{0.25 - \frac{IC}{0.9}} = 0.5 + \sqrt{0.25 - \frac{0.026}{0.9}}$$

$$= 0.97 \ (\geq 0.95)$$

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

$$= 208.05 mm$$

$$A_3 = \frac{M_2}{0.95 F_u Z} = \frac{61.62 \times 10^6}{0.95 \times 410 \times 208.05}$$

$$= 760.41 mm^2$$

Provide Y12 @ 125 c/c ($A = 905 mm^2$)