

Example - 1 -

For the intermediate flat plate floor system shown, if:

story height = 2.75 m

Columns = 400 x 400 mm

partitions = 1 kN/m² other D.L = 1.0 kN/m²

L.L = 2.5 kN/m², $f'_c = 20$ MPa, $f_y = 420$ MPa

Find slab thickness and check punching shear.

Solution

1 - Slab thickness for deflection control

Table (9.5c)

$$h = \frac{l_n}{30} \quad (\text{Ext. panel without edge beam})$$

$$h = \frac{5500 - 400}{30} = 170 \text{ mm}$$

2 - check punching shear at interior column (Neglect Moment transfer)

$$d_{ave} = 170 - 20 - 10 = 140 \text{ mm}$$

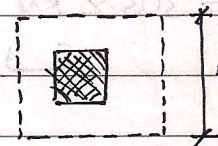
$$DL = 0.17 \times 24 + 1 + 1 = 6.08 \text{ kN/m}^2$$

$$W_u = 1.2(6.08) + 1.6(2.5) = 11.30 \text{ kN/m}^2$$

$$V_u = 11.30 (5.5 \times 4.25 - (0.54)^2)$$

$$= 260.85 \text{ kN}$$

$$400 + 140 = 540$$



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$$b_o = 4 \times 540 = 2160 \text{ mm}$$

shear strength of concrete

$$\phi V_c = 0.75 \times \frac{1}{3} \sqrt{20} \times 2160 \times 140 \times 10^{-3} = 338 \text{ kN} \leftarrow \text{Control}$$

$$\phi V_c = 0.75 \left(2 + \frac{4}{1}\right) \sqrt{20} \times 2160 \times \frac{140}{12} \times 10^{-3} = 507 \text{ kN}$$

$$\phi V_c = 0.75 \left(\frac{40 \times 140}{2160} + 2\right) \sqrt{20} \times 2160 \times \frac{140}{12} \times 10^{-3} = 388 \text{ kN}$$

$$\therefore V_u = 260.85 < \phi V_c = 338 \text{ kN}$$

OK//

punching shear not critical

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shear

1

