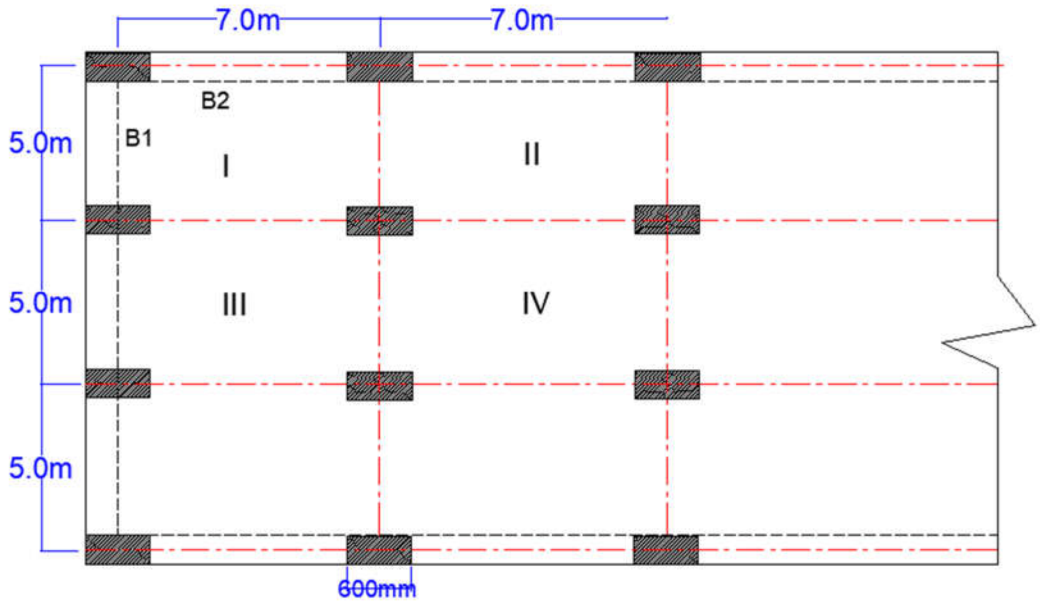
ALMUSTAQBAL UNIVERSITY

CONSTRUCTION&BUILDING ENGINEERING TECHNOLOGY

ANALYSIS & DESIGN OF REINFORCED CONCRETE STRUCTURES

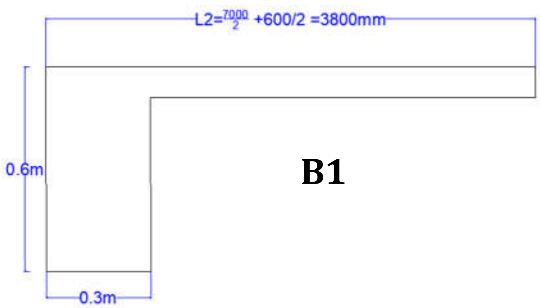
SLAB THICKNESS III
(EXAMPLES)

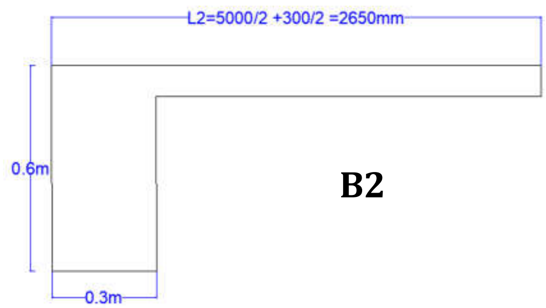
Example Twelve: for the flat plate shown below, find the required slab thickness. Use $f_y = 420MPa$, columns are of size $(300 \times 600mm)$ and beams are of size $(300 \times 600mm)$.



Solution:

- The slab is: ***without interior beams*** and ***without drop panel***





- Determine B1 & B2……. Assume $h_f = 150mm$.

$$\alpha_{B1} = (1.5 \times \frac{300 \times 600^3}{12} \Big/ \frac{3800(150)^3}{12}) = 7.57 \qquad > 0.8$$

$$\alpha_{B2} = (1.5 \times \frac{300 \times 600^3}{12} \Big/ \frac{2650(150)^3}{12}) = 10.8 \qquad > 0.8$$

Since the slab is with an edge beam:

$$for\ the\ exterior\ panels\ I, II\ and\ III \quad \rightarrow \quad l_n = 7000 - 600 = 6400mm$$
$$for\ the\ interior\ panel\ IV \quad \rightarrow \quad l_n = 7000 - 600 = 6400mm$$

$\therefore$ *since the slab is without interior beams* $\rightarrow$ *use table* 8.3.1.1

$$h = \frac{l_n}{33} = \frac{6400}{33} = 193.9mm \quad > 150mm$$

$\therefore$ *use* $h_{slab} = 200mm$

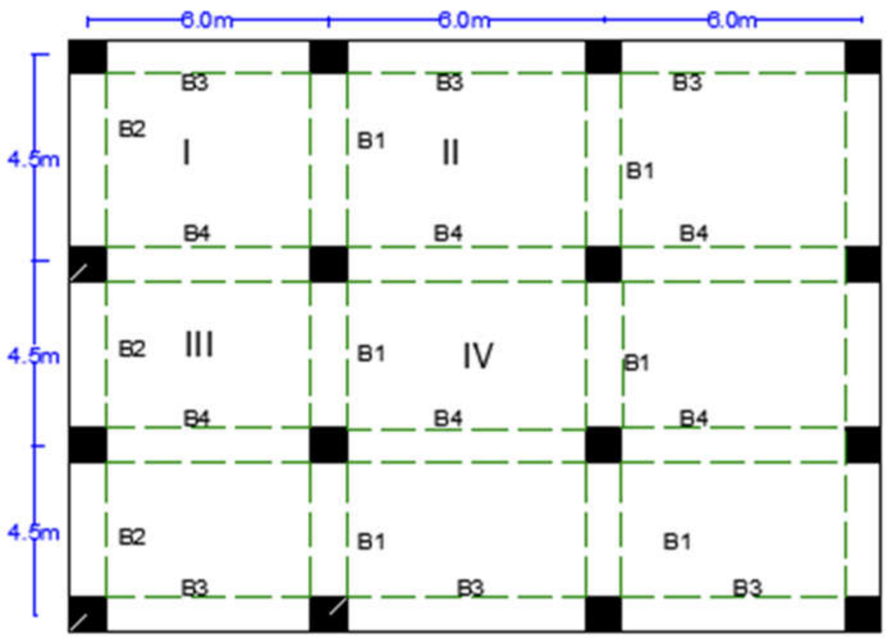
Check the edge beam:

$$\alpha_{B1} = (1.5 \times \frac{300 \times 600^3}{12}) \Big/ \left(\frac{3800 \times (200)^3}{12}\right) = 3.197 \quad > 0.8 \quad o.k.$$

$$\alpha_{B2} = (1.5 \times \frac{300 \times 600^3}{12}) \Big/ \left(\frac{2650 \times (200)^3}{12}\right) = 4.58 \quad > 0.8 \quad o.k.$$

$$\therefore \boldsymbol{use\ h_{slab} = t = 200mm}$$

Example Thirteen: for the floor-beam system shown in the figure below, check if the slab thickness (t=140mm) is satisfactory. $f'_c = 25MPa, f_y = 420MPa$, all column sizes are of (350×350) mm and all beam sizes are of (350×500)mm.



Solution:

$$\alpha_{B1} = \frac{2 \times 350 \times (500)^3}{6000(140)^3} = 5.314 \quad > 0.8$$

$$\alpha_{B2} = \frac{1.5 \times 350 \times (500)^3}{(3000 + 175)(140)^3} = 7.532 \quad > 0.8$$

$$\alpha_{B3} = \frac{1.5 \times 350 \times (500)^3}{(2250 + 175)(140)^3} = 9.862 \quad > 0.8$$

$$\alpha_{B4} = \frac{2 \times 350 \times (500)^3}{4500(140)^3} = 7.086 \quad > 0.8$$

Panel I: $\alpha_{fm} = \frac{5.314+7.532+9.862+7.086}{4} = 7.44 \quad > 2$

Panel II: $\alpha_{fm} = \frac{2(5.314)+9.862+7.086}{4} = 6.894 \quad > 2$

Panel III: $\alpha_{fm} = \frac{5.314+7.532+2(7.086)}{4} = 6.75 \quad > 2$

Panel IV: $\alpha_{fm} = \frac{2(5.314)+2(7.086)}{4} = 6.2 \quad > 2$

All calculated $\alpha_{fm} > 2$ ……. Use table 8.3.1.2

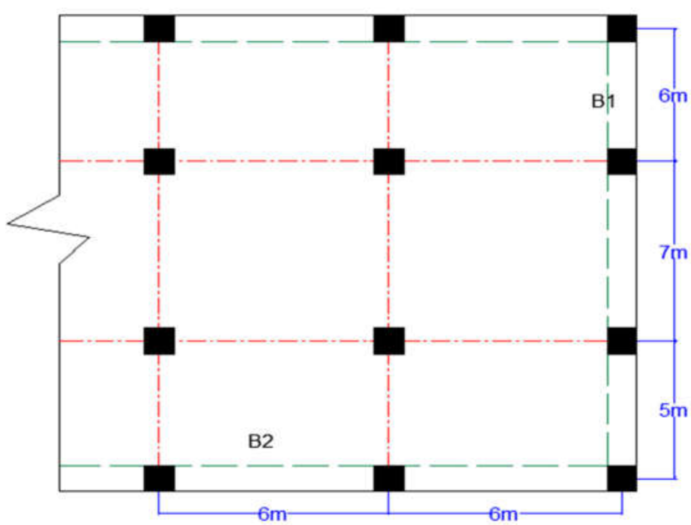
$l_n = 6000 - 350 = 5650mm,\quad S_n = 4500 - 350 = 4150mm,\quad \beta = \frac{5650}{4150} = 1.36$

$$h = \frac{l_n(0.8 + \frac{fy}{1400})}{36 + 9\beta} = \frac{5650(0.8 + \frac{420}{1400})}{12} = 128.8mm \ > 90mm$$

$h_{calculated} = 128.8mm \ < h_{given} = 140mm$

$$\therefore h = 140mm.$$

Example Fourteen: for the intermediate floor shown below, estimate the minimum thickness $f'_c = 25MPa$, $f_y = 420MPa$, beam size $(300 \times 500mm)$ and column size $(300 \times 300mm)$. Use $t = 150mm$.



Solution:

- The slab is ***without interior beams***, and ***without drop panels***.
- Since the slab has edge beams, these beams should be checked.

$$\alpha_{B1} = \frac{1.5 \times 300 \times (500)^3}{(3150)(150)^3} = 5.29 \quad > 0.8$$

$$\alpha_{B2} = \frac{1.5 \times 300 \times (500)^3}{(2650)(150)^3} = 6.28 \quad > 0.8$$

Panel I: $h = \frac{l_n}{33} = \frac{5700}{33} = 172.72mm$

Panel II: $h = \frac{l_n}{33} = \frac{6700}{33} = 203mm$

Panel III: $h = \frac{l_n}{33} = \frac{5700}{33} = 172.72mm$

Panel IV: $h = \frac{l_n}{33} = \frac{6700}{33} = 203mm$

$\therefore h = 210mm \quad > \quad 150mm$

Since the slab thickness has been changed from 150mm to 210mm, we have to recheck the edge beams.

$$\alpha_{B1} = \frac{1.5 \times 300 \times (500)^3}{(3150)(210)^3} = 1.92 \quad > 0.8$$

$$\alpha_{B2} = \frac{1.5 \times 300 \times (500)^3}{(2650)(210)^3} = 2.29 \quad > 0.8$$

$$\therefore \boldsymbol{h = 210mm}$$