



**ALMUSTAQBAL UNIVERSITY COLLEGE**

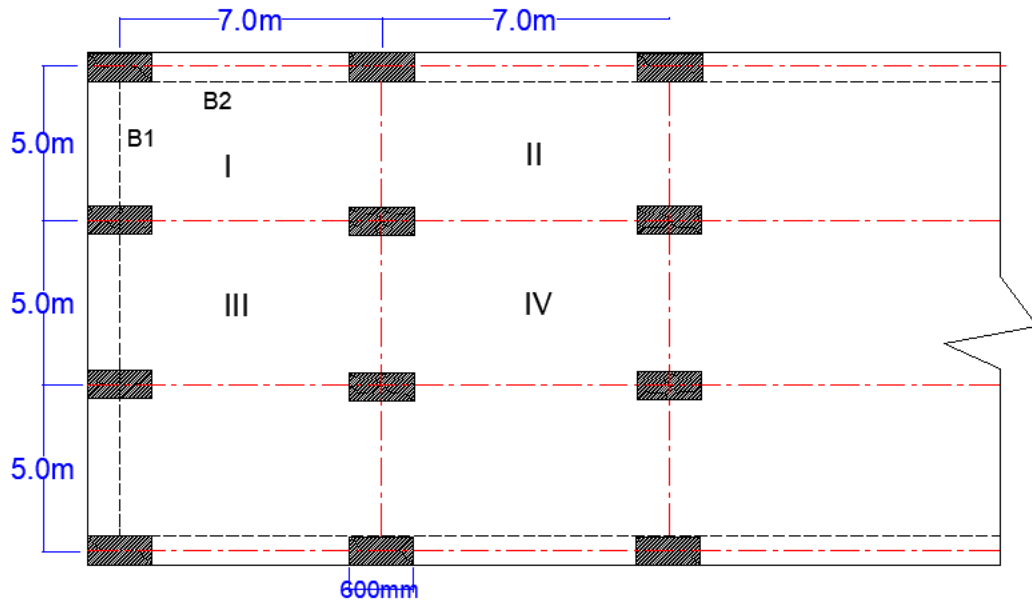
**CONSTRUCTION&BUILDING ENGINEERING TECHNOLOGY**

**ANALYSIS & DESIGN OF REINFORCED CONCRETE STRUCTURES**

**SLAB THICKNESS III  
(EXAMPLES)**

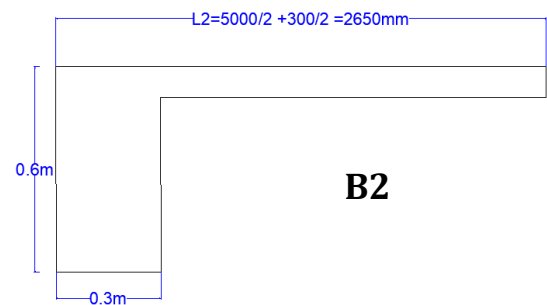
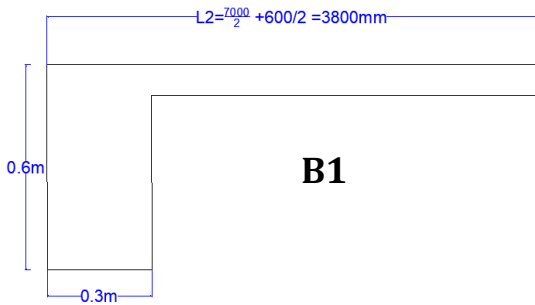
**Dr. MOHAMMED ZUHEAR ALMULALI**

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



**Solution:**

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



- Determine B1 & B2..... Assume  $h_f = 150\text{mm}$ .

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

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

Since the slab is with an edge beam:

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

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

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

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

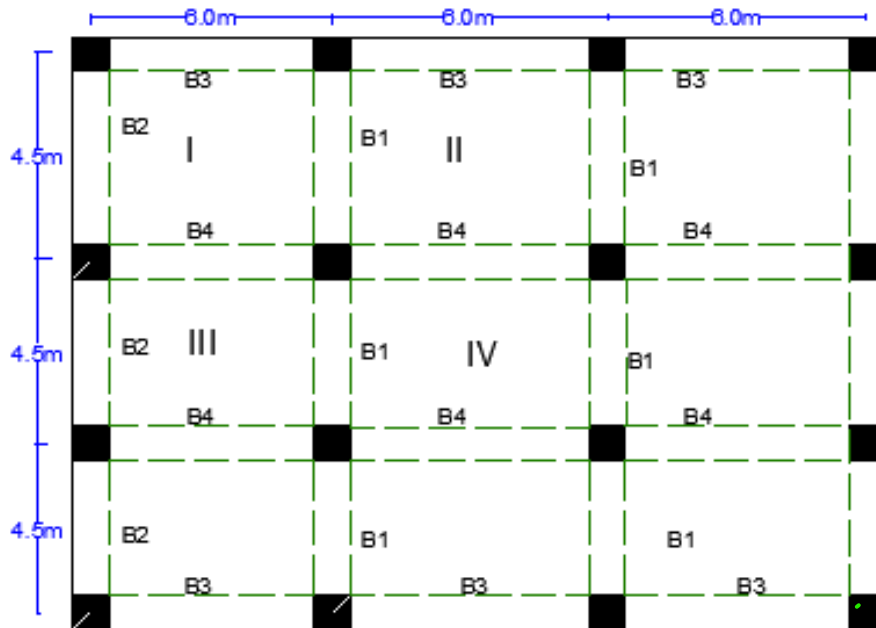
Check the edge beam:

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

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

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

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



**Solution:**

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

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

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

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

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

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

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

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

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

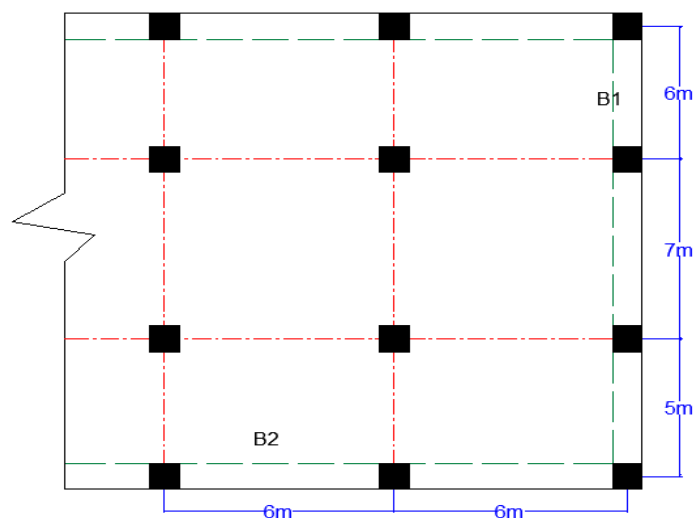
$$l_n = 6000 - 350 = 5650\text{mm}, \quad S_n = 4500 - 350 = 4150\text{mm}, \quad \beta = \frac{5650}{4150} = 1.36$$

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

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

$$\therefore h = 140\text{mm}.$$

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



### Solution:

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

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

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

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

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

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

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

$$\therefore h = 210\text{mm} > 150\text{mm}$$

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

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

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

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