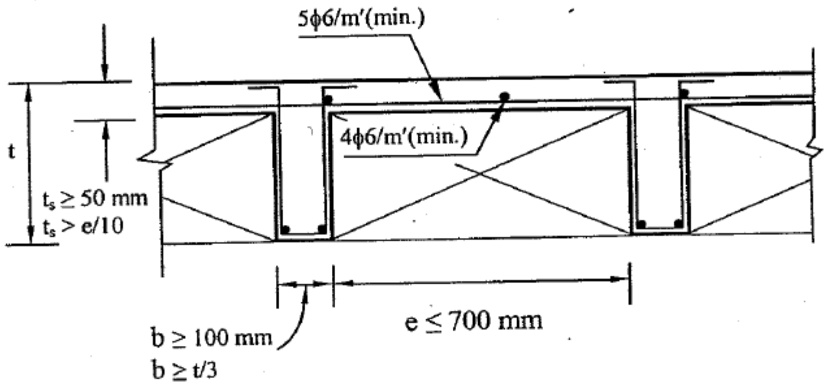
Hollow Blocks



Cross rib requirements		
Live load (KN/m^2)	Span (m)	Condition
<= 3	<=5	No cross rib
<=3	>5	One cross rib
>3	4 to 7	One cross rib
>3	>7	Three cross rib

Development length

$$L_{d,compression} = 40\ \varphi$$
$$L_{d,tension} = 60\ \varphi$$

H.B & hidden beams (L/t) to avoid deflection calc.	
simple	20
Cont. 1-end	25
Cont. 2-end	28
Cantilever	8

Check of shear

$$q_u = \frac{Q_u}{bd}$$

$$q_{cu}(uncracked) = 0.16\sqrt{\frac{f_{cu}}{\gamma_c}}\ N/mm^2$$

$$q_{cu}(cracked) = 0.12\sqrt{\frac{f_{cu}}{\gamma_c}}\ N/mm^2$$

$$q_{umax} = 0.7\sqrt{\frac{f_{cu}}{\gamma_c}}\ N/mm^2 \le 4.4\ N/mm^2$$

$$q_{su} = q_u - q_{cu}(cracked) \qquad q_{su} = \frac{A_{st}\left(\frac{f_{yst}}{\gamma_s}\right)}{b\,S}$$

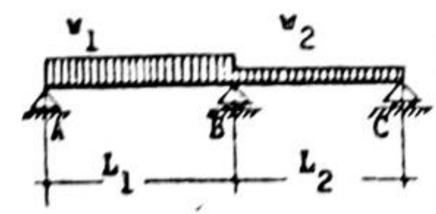
For Hidden Beams and Slabs:

$$q_{cu}\ \text{in (MPa)} = 0.16 \times \sqrt{\frac{f_{cu}}{\gamma_c}}$$

Continuity	tmin two way solid slab	tmin one way solid slab	m
	Ls/35	Ls/30	1
	Ls/40	Ls/35	0.87
	Ls/45	Ls/40	0.76

French Equation

$$M_B = -\frac{w_1 L_1^3 + w_2 L_2^3}{8\,(L_1 + L_2)}$$



α, β of the egyptian code

$$\alpha = \frac{r}{2} - 0.15 \qquad \beta = \frac{0.35}{r^2}$$

Marcus coefficients

r	1	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2
α	0.396	0.473	0.543	0.606	0.66	0.706	0.746	0.778	0.806	0.83	0.849
β	0.396	0.333	0.262	0.212	0.172	0.14	0.113	0.093	0.077	0.063	0.053

Grashoff's coefficients

$$\alpha = \frac{r^4}{1+r^4} \qquad \beta = \frac{1}{1+r^4}$$

Equivalent load for bending and shear

$$\alpha = 1 - \frac{1}{3r^2} \qquad \beta = 1 - \frac{1}{2r}$$

$$A_{smin}(\text{beams}) = \text{smaller of} \left(\frac{0.225\sqrt{f_{cu}}}{f_y} \times b \times d \,,\, 1.3A_s\right)$$

$$\geq (0.15\% \times b \times d) \text{ case of H.G steel.}$$

$$A_{smin}(\text{slabs}) = \frac{0.6}{f_y} \times b \times d \quad \geq (0.15\% \times b \times d) \text{ case of H.G steel.}$$

$$A_{stmin}\ (\text{stirrups}) = (0.4/fy).b.s$$

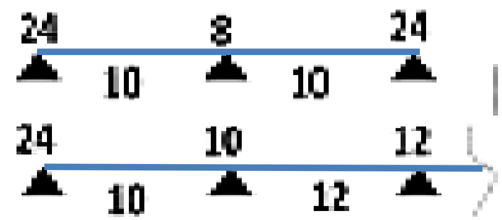
Effective width of flange $B_{effective}$

The smallest of $\left(16t_s + b \,,\, \frac{L}{5} + b \,,\, \text{c.l to c.l}\right)$ case of T – section

The smallest of $\left(6t_s + b \,,\, \frac{L}{10} + b \,,\, \text{c.l to edge}\right)$ case of L – section

Moment coefficients (K) for slabs

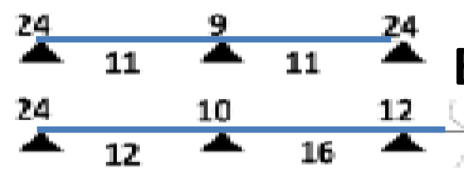
$$M = \frac{w \times L^2}{K}$$



Shear and Moment coefficients (K) for Beams

$$M = \frac{w \times L^2}{K} \quad , \quad Q = w \times L \times K$$

Shear



Bending

Flat Slabs

Moment Distribution factors for empirical method

Strip	Type of end support*	Exterior panel			Interior panel	
		Exterior negative moments	Positive moments	Interior negative moments	Negative moments	Positive moments
Column strip	a	25	30	50	45	25
	b	20	30			
Field strip	a	5	20	20	15	15
	b	10	20			

* Types of end support

a- No beams.

b- Beams with total depth equal or greater than three times slab thickness t.

$$\gamma_q = 1 - \gamma_f \qquad \gamma_f = \frac{1}{1 + \left(\frac{2}{3}\right)\sqrt{\frac{c_1 + d}{c_2 + d}}}$$

$$M_{Fq} = \gamma_q M_F \qquad M_{FF} = \gamma_f M_F$$

$$M = \frac{w_u L_2}{8}\left(L_1 - \frac{2D}{3}\right)^2$$

$$q_{cup,uncracked} = \text{the smallest of} \begin{Bmatrix} 0.316\sqrt{\frac{f_{cu}}{\gamma_c}}^{\,o} \\ 0.316\left(0.5 + \frac{b}{t}\right)\sqrt{\frac{f_{cu}}{\gamma_c}} \\ 0.8\left(\frac{\alpha d}{b_o} + 0.2\right)\sqrt{\frac{f_{cu}}{\gamma_c}} \\ 1.7\ N/mm^2 \end{Bmatrix}$$

$$q_{up} = \frac{Q_{up}\,\beta}{b_o\,d}$$

β = 1.15 (interior column)

β = 1.30 (exterior column)

β = 1.50 (corner column)

α = 4 for interior column

α = 3 for exterior column

α = 2 for corner column

$$q_{cup}(cracked) = 0.12\sqrt{\frac{f_{cu}}{\gamma_c}}$$

$$q_{up} \le 0.45\sqrt{\frac{f_{cu}}{\gamma_c}}$$

$$q_{sup} = q_{up} - q_{cup}(cracked)$$

$$q_{sup} = \frac{A_{st}\left(\frac{f_y}{\gamma_s}\right)}{b_o\ s} \qquad f_y \le 350\ N/mm^2$$