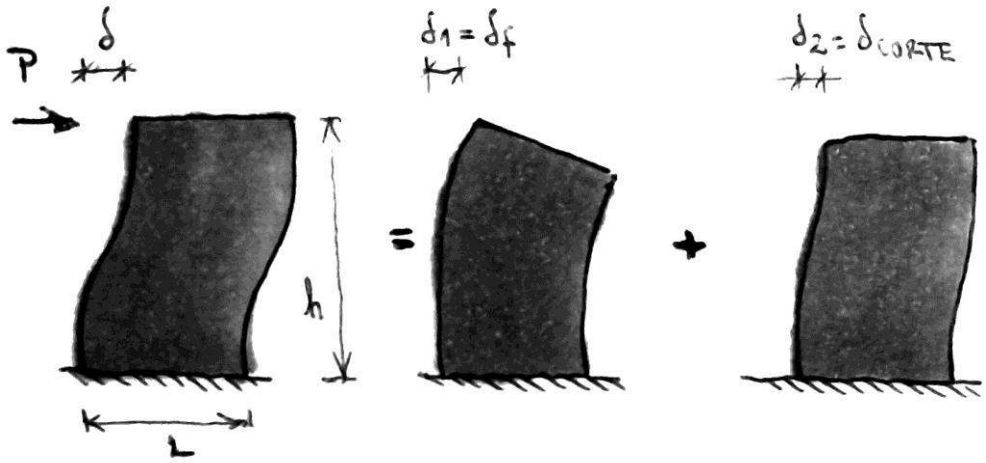
En resumen, se tiene gráficamente



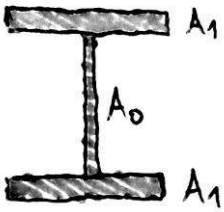
$$\delta = \delta_1 + \delta_2 = \frac{Ph^3}{3EI} + \frac{\chi Ph}{GA}$$ Con Diafragma

$$\delta = \delta_1 + \delta_2 = \frac{Ph^3}{12EI} + \frac{\chi Ph}{GA}$$ Con Diafragma, continuidad de muro y dintel de acoplamiento

Factor de forma χ

Rectangular $\chi = 1.2$

Doble T

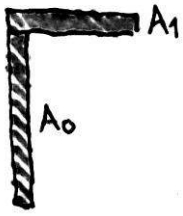


$$\beta = \frac{2A_1}{A_0} \qquad \chi = \frac{1+\beta}{\left(\frac{1}{3}+\beta\right)^2}\left(\beta^2 + \frac{2}{3}\beta + \frac{2}{15}\right)$$

β	0	0.5	1	2	3
χ	1.2	1.65	2.02	3.01	4.01

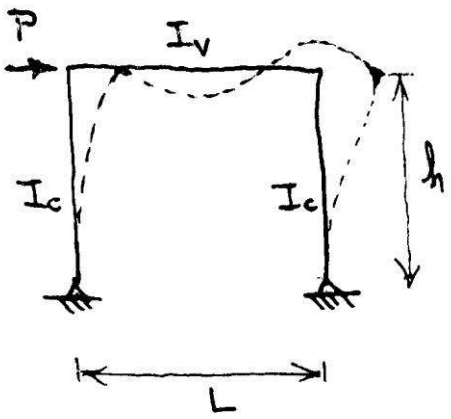
Circular $\chi = 1.2$

Angulo



$$\beta = \frac{A_1}{A_0} \quad \chi = \frac{6\left(1+\beta\right)^2\left(1+8\beta+53\beta^2\right)}{5\left(1+5\beta+2\beta^2\right)^2}$$

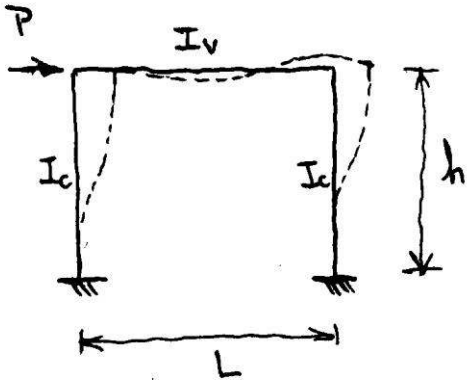
β	0	0.5	1	2	3	∞
χ	1.2	1.65	2.02	3.01	4.01	15.9



Pórtico Rotulado

$$\delta = \frac{Ph^2}{6E}\left(\frac{h}{I_C} + \frac{L}{2I_V}\right)$$

$$K = \frac{6E}{h^2\left(\frac{h}{I_C} + \frac{L}{2I_V}\right)}$$

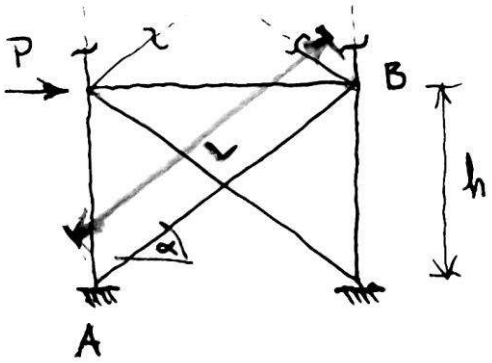


Pórtico Empotrado

$$\delta = \frac{Ph^2}{6E}\left(\frac{h}{I_C}(1-3\alpha\beta) + \frac{\beta^2 L}{2I_V}\right)$$

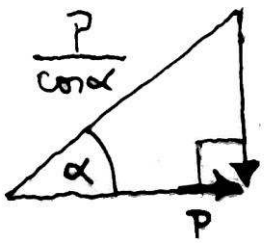
$$\alpha = \frac{1+3\gamma}{1+6\gamma}, \beta = \frac{3\gamma}{1+6\gamma}, \gamma = \frac{I_V h}{I_C L}$$

$$K = \frac{6E}{h^2\left(\frac{h}{I_C}(1-3\alpha\beta) + \frac{\beta^2 L}{2I_V}\right)}$$



Pórtico Arriostrado

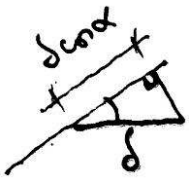
Asumo existencia sólo de barra AB



Fuerza en la diagonal a tracción

$$P_b = \frac{P}{\cos\alpha}$$

Deformación de la diagonal a tracción



$$\delta_b = \delta \cos\alpha$$

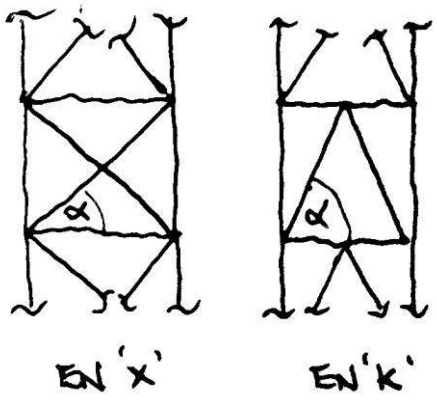
Análisis de la barra diagonal traccionada

$$\delta = \frac{PL}{AE} \Rightarrow \delta \cos\alpha = \frac{\frac{P}{\cos\alpha} L}{AE}$$

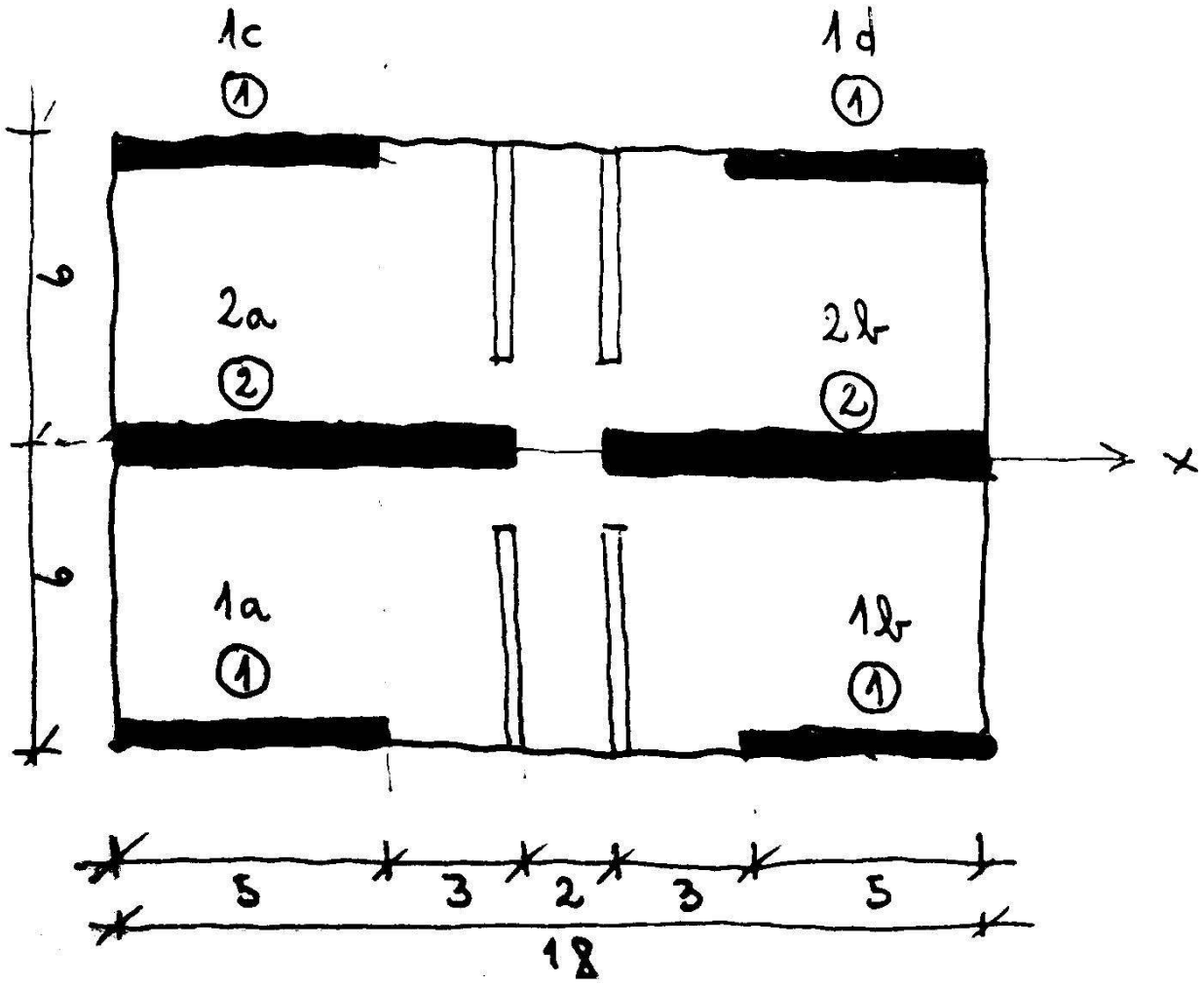
$$\delta = \frac{PL}{AE \cos^2 \alpha}$$ Deformación de entrepiso

$$K = \frac{P}{\delta} = \frac{EA \cos^2 \alpha}{L}$$

Con diagonales cruzadas en ‘X’ o con diagonales en ‘K’ la rigidez es el **doble**



Planta Estructural



Datos

$$e_m = 0.2[m]$$

$$E = 3000000\left[\frac{Kg}{cm^2}\right]$$

$$\nu = 0.167, G = 0.43E$$

$$K = \frac{1}{\frac{h^3}{3EI} + \frac{\chi h^3}{GA}}$$

$$H = 10[m]$$

4° Piso $$Q_P = 21.8[ton]$$

Muro 1

$$I = \frac{bL^3}{12} = \frac{1}{12} \times 0.2 \times 5^3 = 2.084[m^4], A = 0.2 \times 5 = 1[m^2]$$

$$\frac{1}{K_f} = \frac{d_f}{P} = \frac{h^3}{3EI} = \frac{10^3}{3 \times 3 \cdot 10^6 \times 2.083} = 0.000053\left[\frac{m}{Kg}\right]$$

$$\frac{1}{K_Q} = \frac{d_Q}{P} = \frac{\chi h}{GA} = \frac{1.2 \times 10}{0.43 \times 3 \cdot 10^6 \times 1} = 0.0000078\left[\frac{m}{Kg}\right]$$

$$K_1 = \frac{1}{\frac{1}{K_f} + \frac{1}{K_Q}} = \frac{1}{0.000061} = 16393\left[\frac{Kg}{m}\right]$$

Muro 2

$$I = \frac{bL^3}{12} = \frac{1}{12} \times 0.2 \times 8^3 = 8.533[m^4], A = 0.2 \times 8 = 1.6[m^2]$$

$$\frac{1}{K_f} = \frac{d_f}{P} = \frac{h^3}{3EI} = \frac{10^3}{3 \times 3 \cdot 10^6 \times 8.533} = 0.000013\left[\frac{m}{Kg}\right]$$

$$\frac{1}{K_Q} = \frac{d_Q}{P} = \frac{\chi h}{GA} = \frac{1.2 \times 10}{0.43 \times 3 \cdot 10^6 \times 1.6} = 0.0000058\left[\frac{m}{Kg}\right]$$

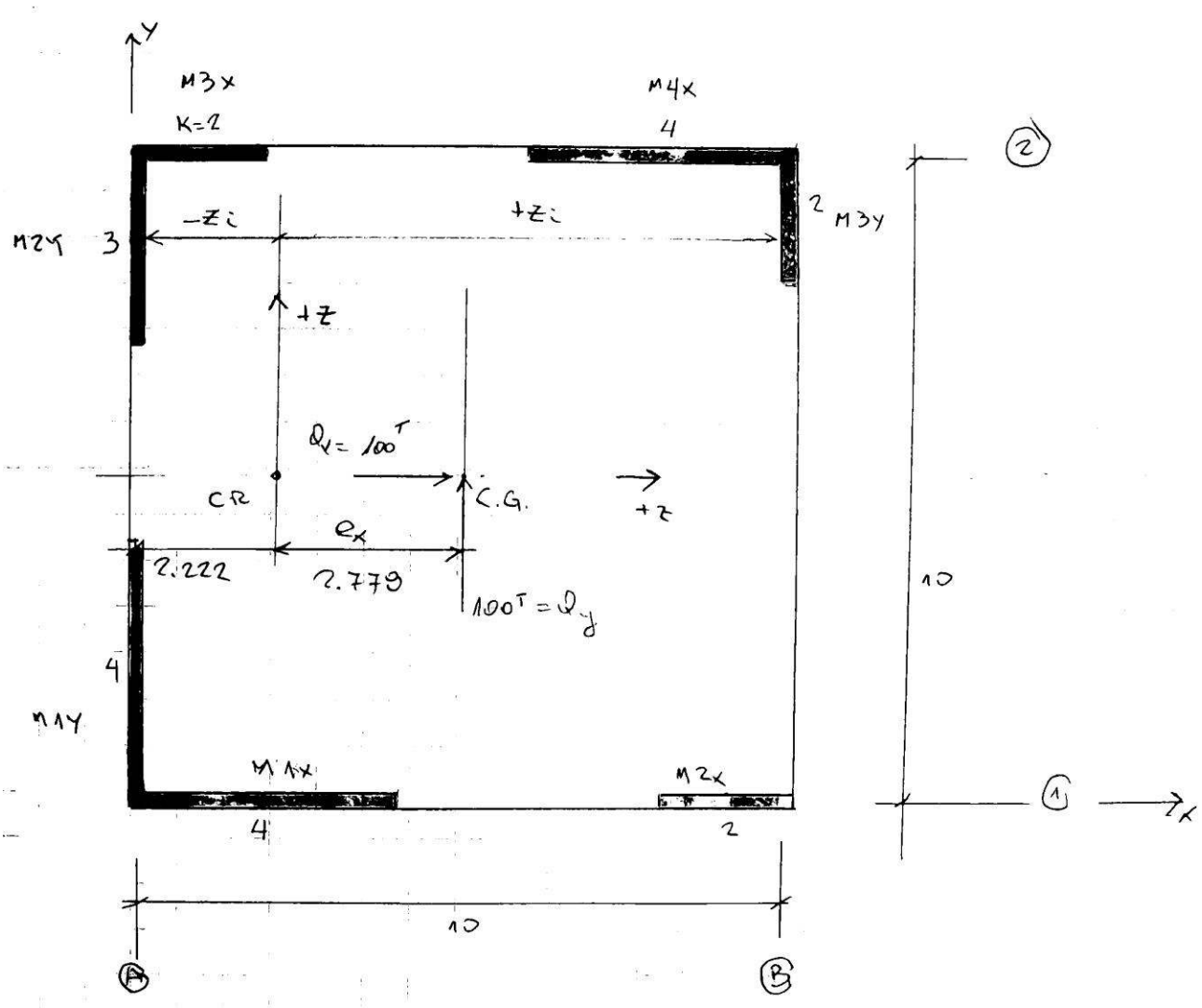
$$K_2 = \frac{1}{\frac{1}{K_f} + \frac{1}{K_Q}} = \frac{1}{0.000019} = 52631\left[\frac{Kg}{m}\right]$$

$$\alpha = \frac{K_i}{\sum_{i=1}^{n} K_i} \qquad Q_i = \alpha Q_T \qquad Q_T = 21.8[ton]$$

MURO	K [Kg/m]	α	Q_i [ton]

1a	16393	0.096	2.09
1b	16393	0.097	2.10
1c	16393	0.098	2.11
1d	16393	0.099	2.12
2a	52631	0.308	6.71
2b	52631	0.309	6.72

1.4.4.- Cálculo de centro de rigidez y gravedad



La planta es simétrica respecto a '***x***', luego se tiene torsión debido a la excentricidad según e_x

Muro	x_i	K_i	$K_i x_i$
1y	0	4	4
2y	0	3	3

3y	10	2	20	

$$X_R = \frac{\sum K_i x_i}{\sum K_i} = \frac{20}{9} = 2.222[m]$$

$$e_x = 5 - 2.222 = 2.778[m]$$

Luego $M_t = 100 \times 2.778 = 277.8[t \cdot m]$

Coeficiente de torsión $\phi_i = \frac{R_i z_i}{\sum R_i z_i^2}$ y $Q_i^t = \phi_i \times M_t$

Corte Directo

$$Q_{ix} = \frac{R_i}{\sum R_i} Q_x \quad \text{según } \boldsymbol{x}$$

$$Q_{iy} = \frac{R_i}{\sum R_i} Q_y \quad \text{según } \boldsymbol{y}$$

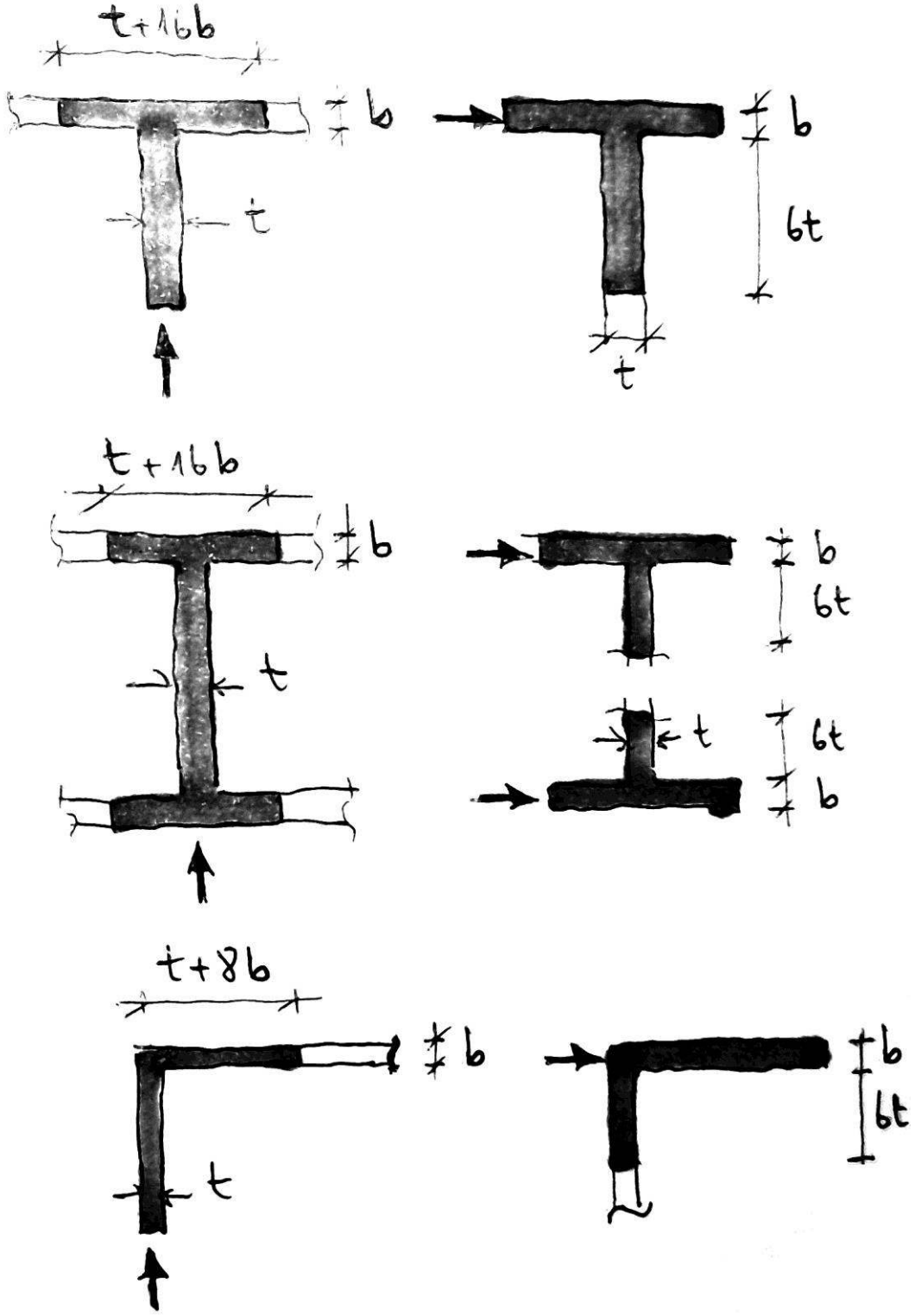
Muro	R_i	Q_i	z_i	$R_i z_i$	$R_i z_i^2$	ϕ_i	Q_i^t	Q_{total}	
		Q_x=100t					[ton]	[ton]	
M1x	4	33,3	-5	-20	100	-0,044	-12,2	45,5	
M2x	2	16,7	-5	-10	50	-0,022	-6,1	22,8	
M3x	2	16,7	5	10	50	0,022	6,1	22,8	
M4x	4	33,3	5	20	100	0,044	12,2	45,5	
	12	100			300	0			
		Q_y=100t							
M1y	4	44,4	-2,222	-8,888	19,794	-0,02	-5,6	38,8	usar 44,4

M2y	3	33,3	-2,222	-6,666	14,812	-0,015	-4,2	29,1	usar 33,3
M3y	2	22,2	7,778	15,556	120,995	0,034	31,7	31,7	
	9	100			155,556	0			

$$\sum R_i z_i = 300 + 155.556 = 455.556$$

1.4.5.- Modelación de anchos colaborantes

Muros T, doble T y L


t+16b
b
t
b
6t
t
t+16b
b
t
b
6t
t
6t
b
t+8b
b
t
b
6t