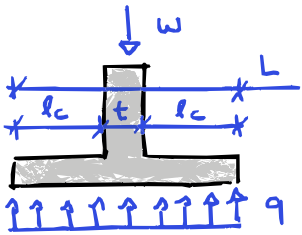
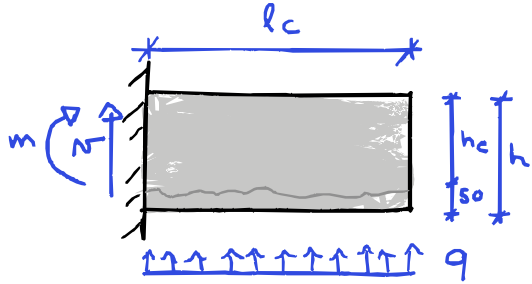
10A - Quick sizing of plain footings (CSA)

FBDs





Hypothesis

- Concrete $f'_c = 25$ MPa, steel $f_y = 400$ MPa
- Normal weight concrete, $\lambda = 1.0$
- Wall thickness $t \geq 0.2$m (8 inches)
- Remove 50mm for bending resistance calcs (22.6.3)

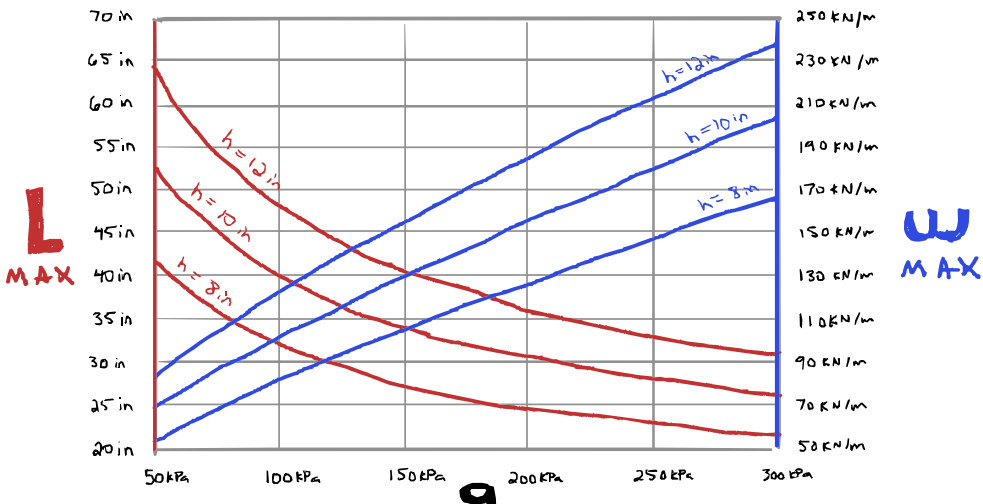
Equations

$$m = \frac{q\,l_{cB}^2}{2},\quad l_{cB} = \sqrt{\frac{2m}{q}},\quad m_R = 0.37\phi\sqrt{f'_c}\,\frac{h_e^2}{6},\quad l_{cB} = \sqrt{\frac{2h_e^2}{5q}}$$

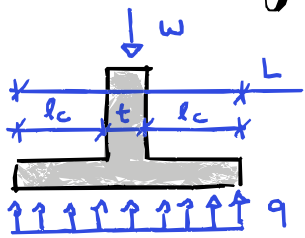
$$N = q\,l_{cv},\quad N_R = 2/3 \cdot 0.18 \cdot \phi_c\sqrt{f'_c}\,h_e,\quad l_{cv} = \frac{0.39\,h_e}{q}$$

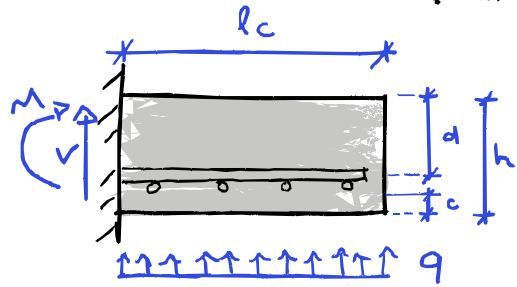
Results

1. Find footing length L to satisfy soil max. bearing.
2. Find soil factored pressure with W_f / L
3. Check that L is below the Lmax value



10B - Quick sizing of min. Reinforced footings (CSA)





Hypothesis

- Concrete $f'_c = 25$ MPa, steel $f_y = 400$ MPa, $d_b = 15M$
- Normal weight concrete, $\lambda = 1.0$
- wall thickness $t \geq 0.2m$ (8 inches)
- cover = 75mm, $d = h - \text{cover} - 1.5\,d_b$

t	max spacing
8 in	18 in.
10 in	14 in.
12 in	12 in.

Equations

$$m = \frac{q\,l_{cb}^2}{2}, \quad l_{cb} = \sqrt{\frac{2m}{q}}, \quad t_R = \frac{\Phi s f_y A_s}{s}, \quad m_R = t_R\left(d - \frac{t_R}{2\alpha_1 \Phi_c f'_c}\right)$$

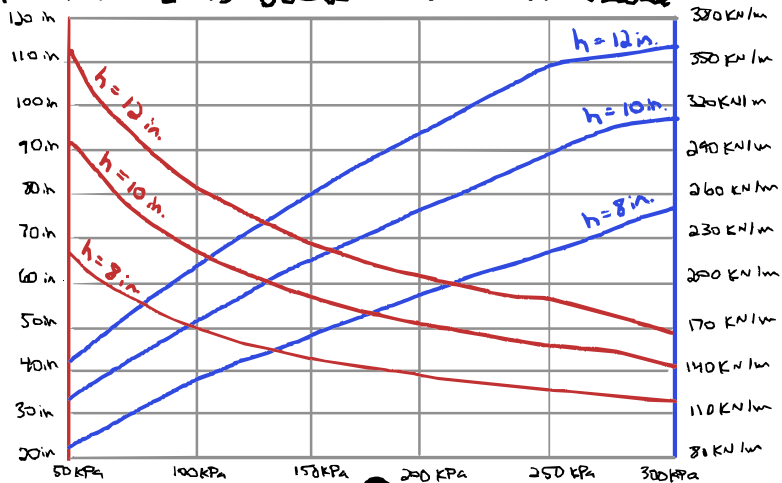
(PLUG INTO)

$$v = q\,l_{cv}, \quad v_R = \Phi_c \beta \sqrt{f'_c} \cdot 0.9d, \quad l_{cv} = \frac{\Phi_c \beta \sqrt{f'_c} \cdot 0.9d}{q}$$

($\beta \rightarrow 0.21$)

Results

1. Find footing length L to satisfy soil max. bearing.
2. Find soil factored pressure with W_f / L
3. Check that L is below the L max value



L MAX

W MAX