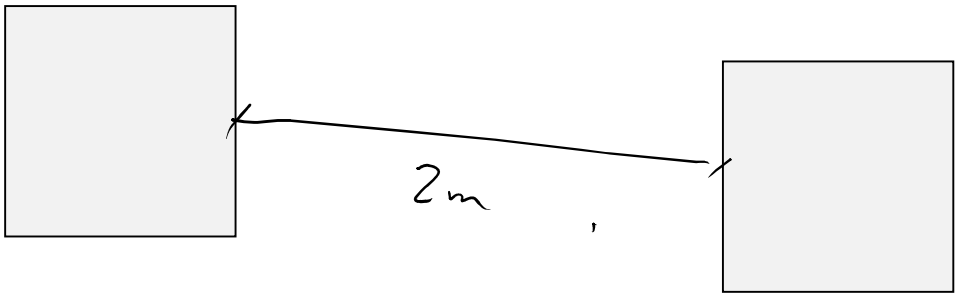
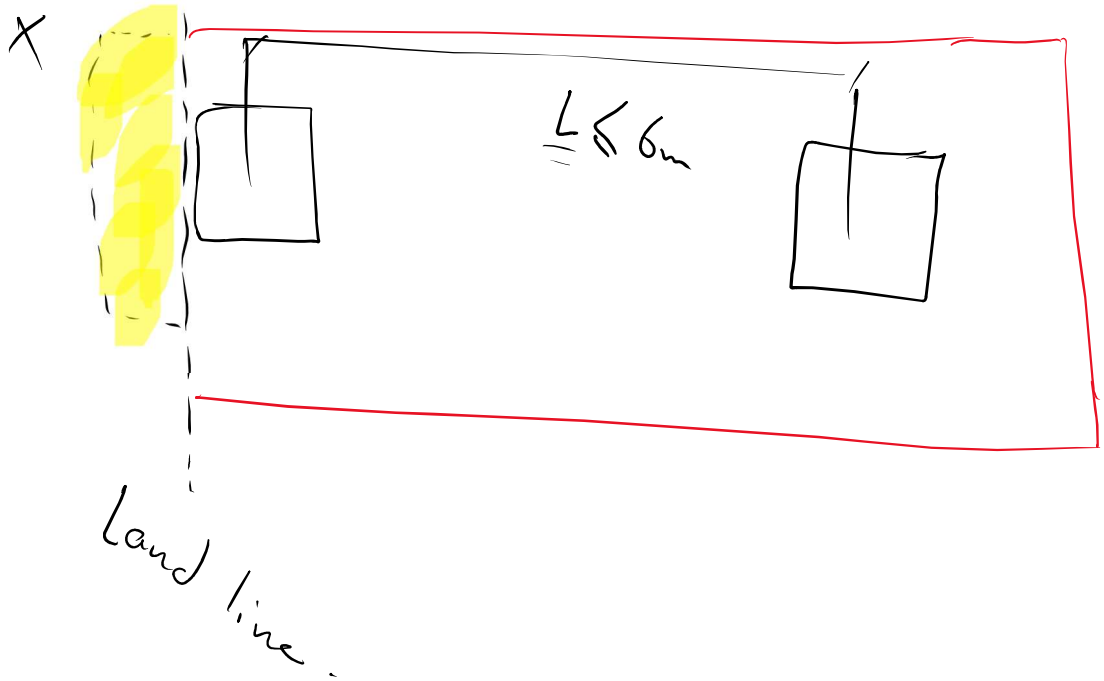
Combined footing

1



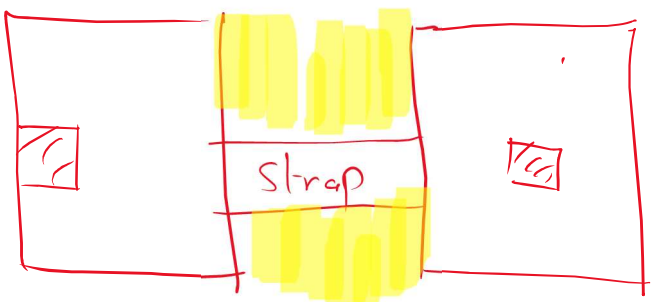
Soil → Clay → $< 100 kN/m^2$

2



Combined footing $L < 6m$

Strap footing $L > 6m$



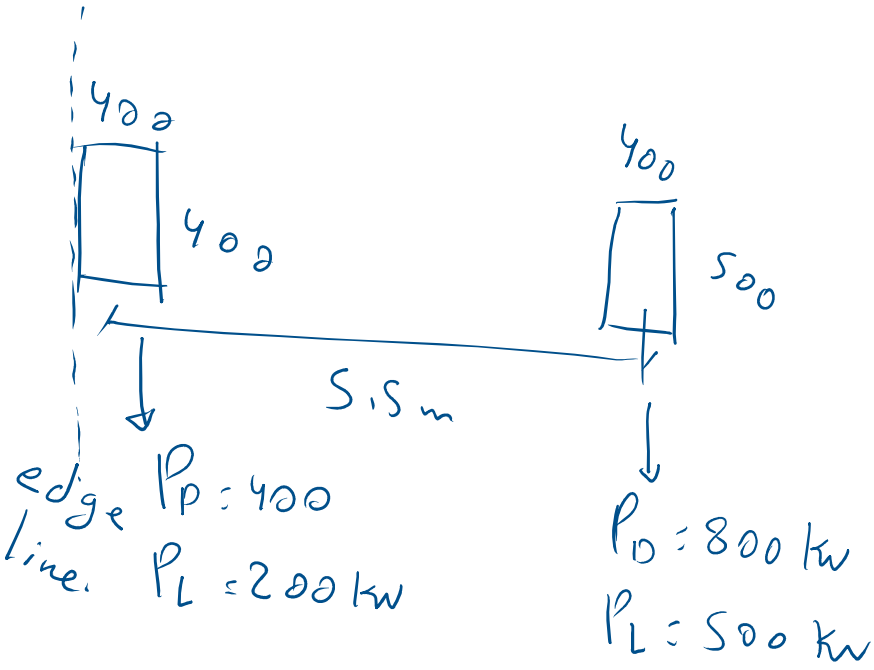
Example 3

Design Combined footing to carry the load on the Columns shown.

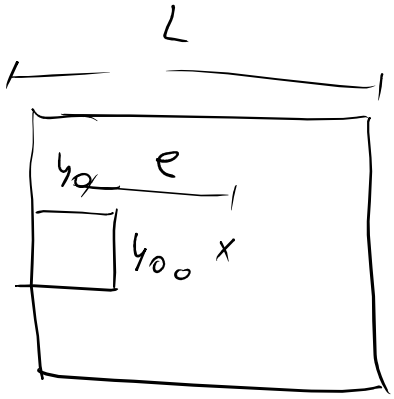
$f'_c = 21\ MPa$.

$f_y = 420\ MPa$.

$q_{all} = 180\ kN/m^2$



if Isolated footing Considered



$P_D = 400$

$P_L = 200$

$$\Rightarrow \frac{L}{2} - e = 0.2$$

$$e = \frac{L}{2} - 0.2$$

to avoid tension ⊕

$$L \geq 6e \qquad 1 - \frac{6e}{L}$$

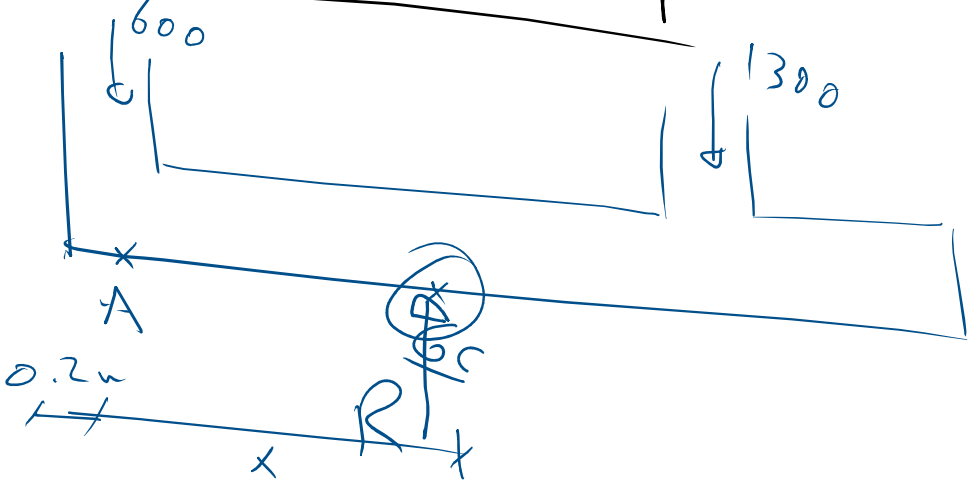
$$L \leq 0.6\ m.$$

$$\rightarrow B \rightarrow \quad 180 = \left(\frac{600}{B \times 0.6}\right)\left(1 + 6 \times \frac{0.6}{2} - 0.2\right) = 180$$

(P_s = 600)

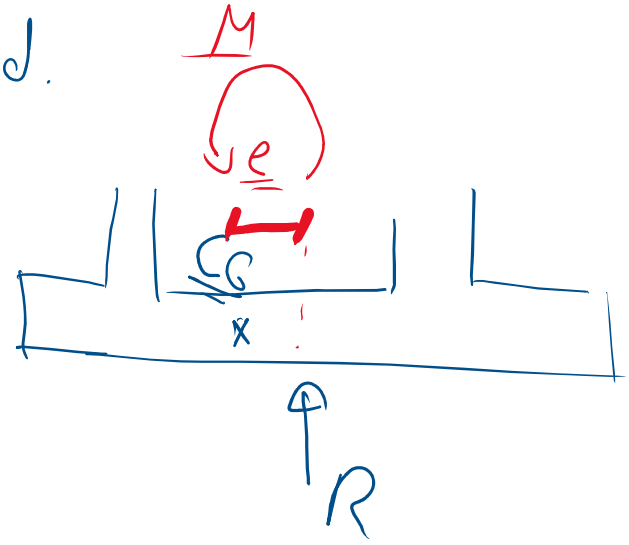
$B = 11m$

→ So use Combined or Strop

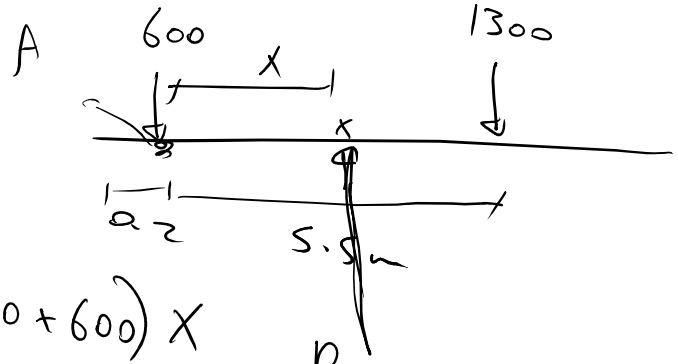


to create uniform stress under footing.

Calculate dim to make center of footing equal center of load.



$\Sigma M_A = 0$

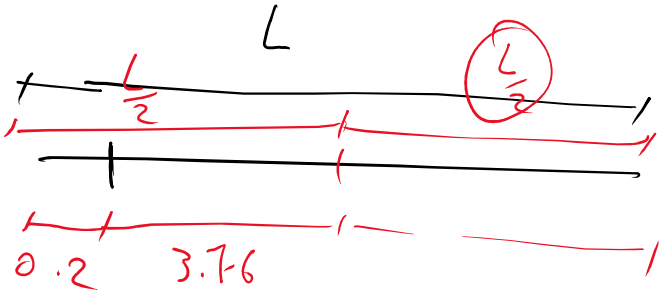


$= 1300 \times 5.5 - (1300 + 600) X$

$\rightarrow X \simeq 3.76m$

$\rightarrow L = 2(3.76 + 0.2)$

$= 7.93m$



assum $L = 8m$ → uniform stress

$\rightarrow \sigma = \frac{P}{A} = \frac{1300+600}{B \times 8m} = 180$

σ ↓ q_{all}

$B = 1.4m$

Notes

Change L → non uniform Stress.

Change B → change in Stress Value.

Thickness

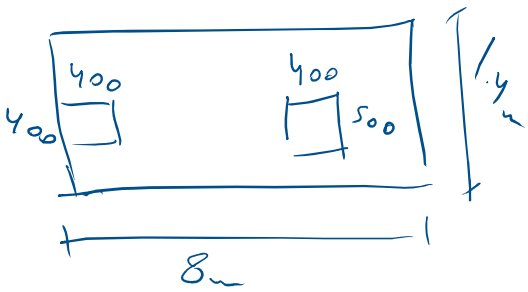
① → punching

→ one way shear

→ $P_{u_1} = 400 \times 1.2 + 200 \times 1.6 = 800\ kN$

→ $P_{u_2} = 800 \times 1.2 + 500 \times 1.6 = 1760\ kN$

→ $\sigma_u = \dfrac{800 + 1760}{1.4 \cdot 8m} = 228.61\ kN/m^2$



→ One Way Shear

$\uparrow V_u$

$\downarrow \phi V_c$

④ = ⑤