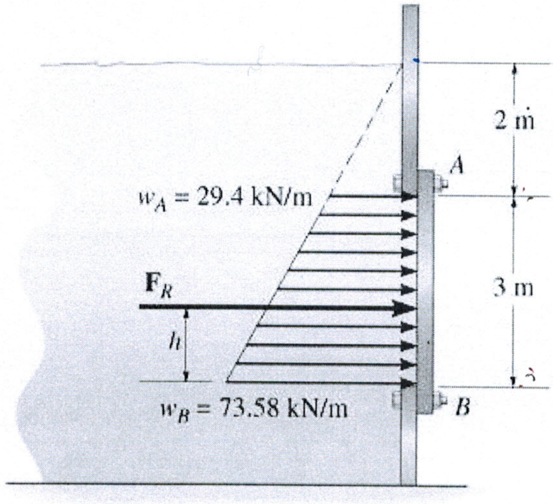
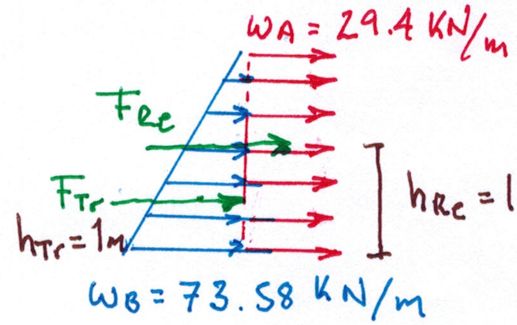
Replace the loading with an equivalent system, i.e., find F_R and h.





$$F_{Tr} = \frac{1}{2}(73.58 - 29.4)\,3 = 66.27 \text{ KN}$$

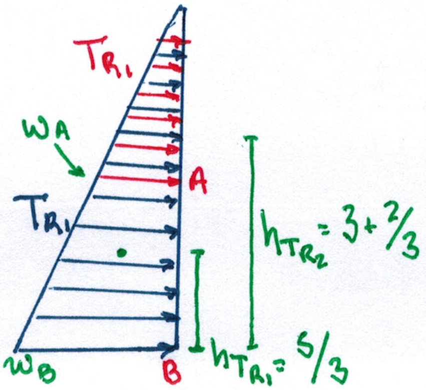
$$F_{Re} = 29.4(3) = 88.2 \text{ KN}$$

$$F_R = T_{Tr} + T_{Re} = 66.27 + 88.2 = \underline{154.5 \text{ kN}}$$

$$\Sigma M_B = F_R h = F_{Tr} h_{Tr} + F_{Re} h_{Re}$$
$$= 66.27(1) + 88.2(1.5) = 198.6 \text{ kN}\cdot\text{m}$$

$$h = \frac{F_{Tr} h_{Tr} + F_{Re} h_{Re}}{F_R} = \frac{198.6}{154.5} = \underline{1.286 \text{ m}}$$

Also, we could have treated the loading as two triangles



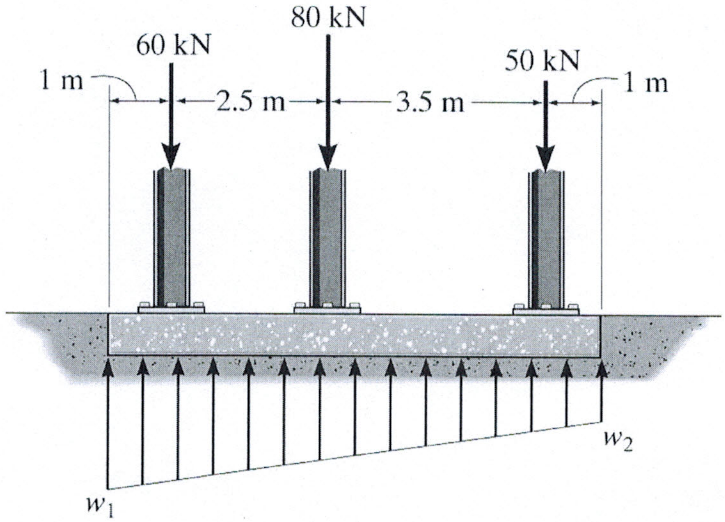
$$\left.\begin{aligned} F_{Tr_1} &= \tfrac{1}{2}(73.58)(5) = 183.95 \text{ KN} \\ F_{Tr_2} &= \tfrac{1}{2}(29.4)(2) = 29.4 \text{ kN} \end{aligned}\right\} \quad F_R = F_{Tr_1} - F_{Tr_2}$$

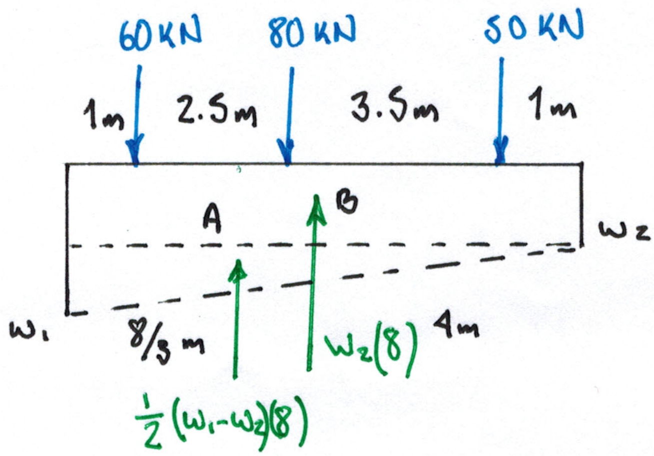
$$183.95 - 29.4 = \underline{154.5 \text{ kN}}$$

$$\Sigma M_B = F_R h = F_{Tr_1} h_{Tr_1} - F_{Tr_2} h_{Tr_2}$$
$$= 183.95(5/3) - 29.4(3 + 2/3) = 198.6 \text{ kN}$$

$$h = \frac{F_{Tr_1} h_{Tr_1} - F_{Tr_2} h_{Tr_2}}{F_R} = \frac{198.6}{154.5} = \underline{1.286 \text{ m}}$$

If the soil exerts a trapezoidal distribution of load on the bottom of the footing, determine the intensities w_1 and w_2 of this distribution needed to support the column loadings.





$\Sigma M_A = 0$

$$w_2(8)\left(4-\tfrac{8}{3}\right) + 60\left(\tfrac{8}{3}-1\right) - 80\left(3.5-\tfrac{8}{3}\right) - 50\left(7-\tfrac{8}{3}\right) = 0$$

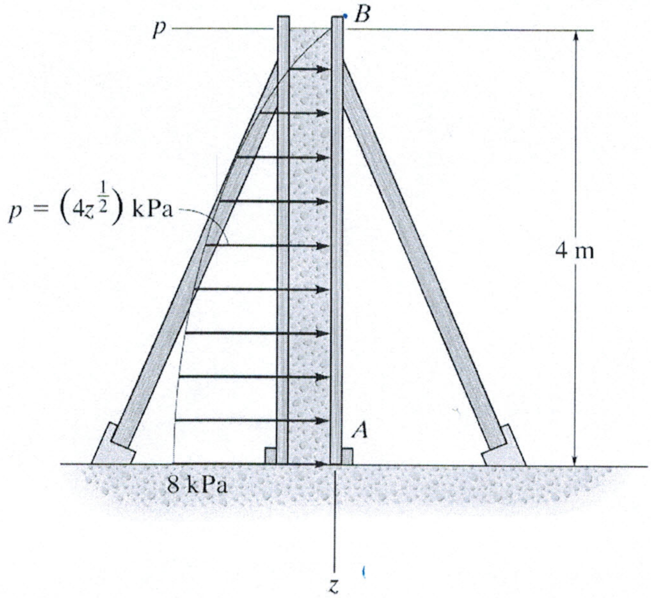
$$w_2 = 17.1875 \text{ KN/m}$$

$\Sigma F_y = 0$

$$\frac{1}{2}(w-17.1875) + 17.1875(8) - 60 - 80 - 50 = 0$$

$$w_1 = 30,3125 \text{ KN/m}$$

The form is used to cast a concrete wall having a width of 5 m. Determine the equivalent resultant force the wet concrete exerts on the form AB if the pressure distribution due to the concrete can be approximated as shown. Specify the location of the resultant force, measured from point B.



$$\int dA = \int_0^4 4z^{1/2}\,dz$$

$$= 4\left(\frac{2}{3}z^{3/2}\right)\Big|_0^4$$

$$= 4\left(\frac{2}{3}4^{3/2}\right) = 21.33 \text{ kN/m}$$

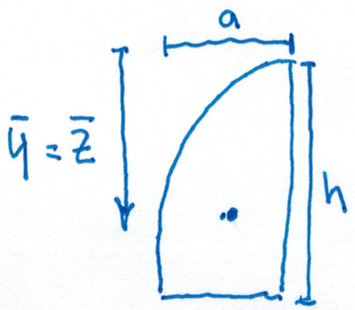
$$F_R = 21.33(5) = 107 \text{ kN}$$

$$\int \bar{z}\,dA = \int_0^4 z(4z^{1/2})\,dz = \int_0^4 4z^{3/2}\,dz = 4\left(\frac{2}{5}z^{5/2}\right)\Big|_0^4$$

$$4\left(\frac{2}{5}4^{5/2}\right) = 51.2 \text{ kN}$$

$$\bar{z} = \frac{\int \bar{z}\,dA}{\int dA} = \frac{51.2}{21.33} = 2.4 \text{ m}$$

$F_R = 21.33(5) = 107$ K



$$A = \frac{2}{3}ah \qquad A = \frac{2}{3}(8)(4) = 21.33$$

$$\bar{y} = \bar{z} = \frac{3}{5}h \qquad \bar{z} = \frac{3}{5}(4) = 2.4 \text{ m}$$