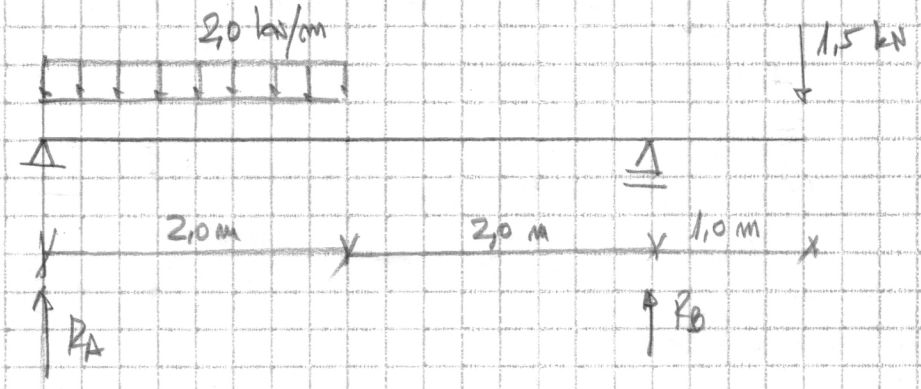
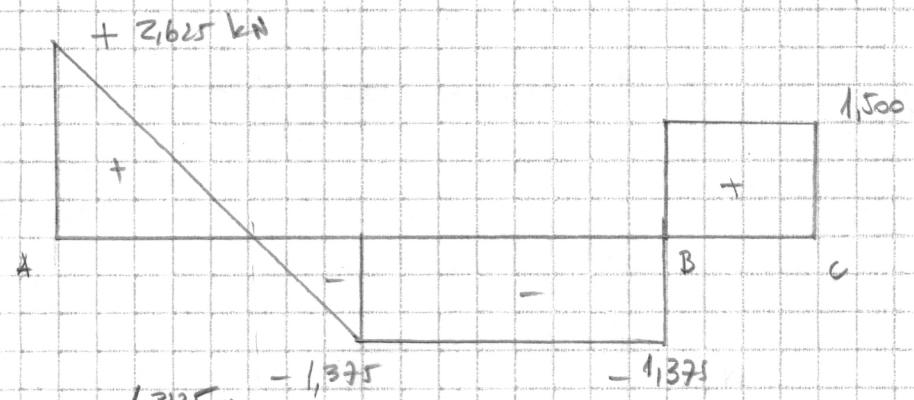
EJERCICIO Nº 2



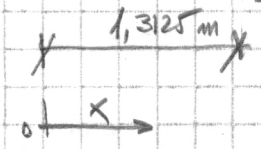
$R_A = 2{,}625$ kN

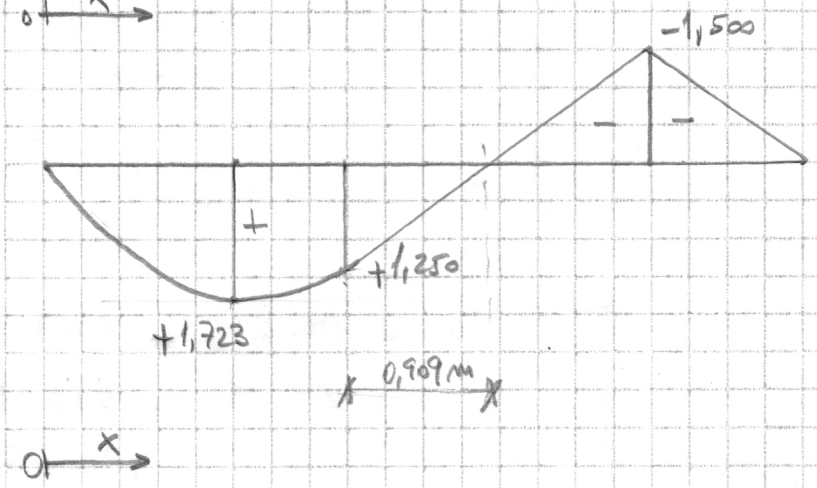
$R_B = 2{,}875$ kN



CORTANTE

[kN]

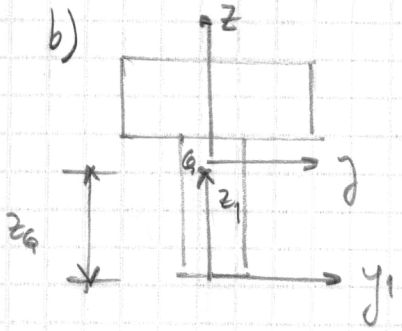




MOMENTO FLECTOR

[kNm]

b)



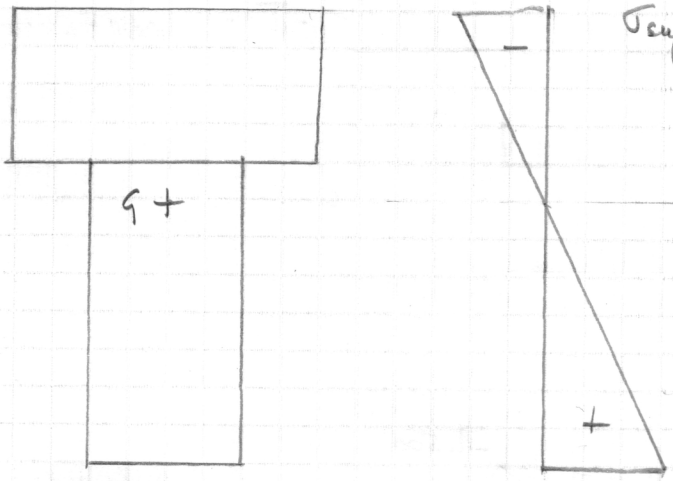
Obtengo z_G la coordenada del centro de gravedad de la sección, medida desde el sistema de ejes (y_1, z_1)

$$z_G = \frac{5 \cdot 10 \cdot 5 + 5 \cdot 10 \cdot 12{,}5}{2(5 \cdot 10)} = 8{,}75 \text{ cm}$$

(y, z) son ejes baricéntricos:

$$I_y = \frac{5 \cdot 10^3}{12} + 5 \cdot 10 \cdot 3{,}75^2 + \frac{10 \cdot 5^3}{12} + 5 \cdot 10 \cdot 3{,}75^2 = 1927{,}08 \text{ cm}^4$$

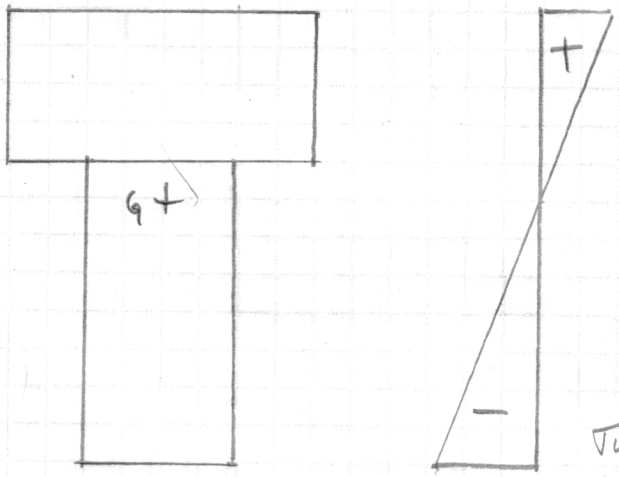
MÁXIMO MOMENTO FLECTOR POSITIVO, $x = 1{,}3125$ m, $M = 1{,}723$ kNm



$$\sigma_{sup} = \frac{-172{,}3 \cdot 6{,}25}{1927{,}08} = -0{,}559 \text{ kN/cm}^2 = -5{,}59 \text{ MPa}$$
(compresión)

$$\sigma_{inf} = \frac{+172{,}3 \cdot 8{,}75}{1927{,}08} = +0{,}782 \text{ kN/cm}^2 = +7{,}82 \text{ MPa}$$
(tracción)

MÁXIMO MOMENTO FLECTOR NEGATIVO, $x = 4{,}00$ m, $M = -1{,}500$ kNm.



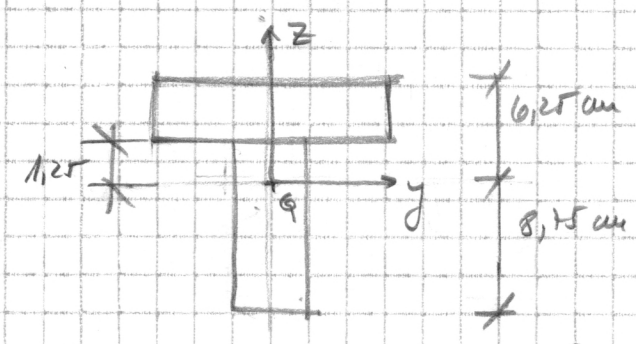
$$\sigma_{sup} = \frac{150 \cdot 6{,}25}{1927{,}08} = 0{,}486 \text{ kN/cm}^2 = 4{,}86 \text{ MPa}$$
(tracción)

$$\sigma_{inf} = -\frac{150 \cdot 8{,}75}{1927{,}08} = -0{,}681 \text{ kN/cm}^2 = -6{,}81 \text{ MPa}$$

EN AMBOS CASOS LA SECCIÓN VERIFICA LOS CRITERIOS DE DIMENSIONADO

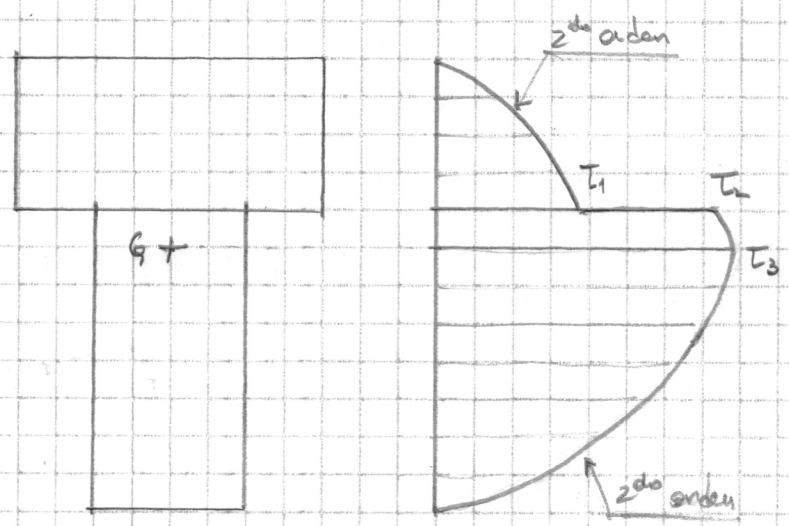
c) LA SECCIÓN CON LA CUAL LA TENSIÓN RASANTE ES MÁXIMA ESTÁ UBICADA EN $x=0$ y $V = 2{,}625$ kN.

$$\tau = \frac{V\mu}{Ib}$$



$$\mu(z=1{,}25) = \int_{1{,}25}^{6{,}25} 10 \cdot z \, dz = 10 \cdot \frac{z^2}{2}\Big|_{1{,}25}^{6{,}25} = 187{,}5 \text{ cm}^3$$

$$\mu(z=0) = \mu_G = -\int_{-8{,}75}^{0} 5 \cdot z \, dz = -5 \cdot \frac{z^2}{2}\Big|_{-8{,}75}^{0} = 191{,}41 \text{ cm}^3$$



$$\tau_1 = \frac{2{,}625 \cdot 187{,}5}{1927{,}08 \cdot 10}$$

$$\tau_1 = 2{,}55 \times 10^{-2} \text{ kN/cm}^2 = 0{,}255 \text{ MPa}$$

$$\tau_2 = 0{,}511 \text{ MPa}$$

$$\tau_3 = \frac{2{,}625 \cdot 191{,}41}{1927{,}08 \cdot 5}$$

$$\tau_3 = 5{,}21 \times 10^{-2} \text{ kN/cm}^2$$

$$\tau_3 = 0{,}521 \text{ MPa}$$

d) $(\tau)_{unión} \cdot b \cdot s \leq R_{adm\,Tornillo}$

$$s \leq 2{,}60 \text{ kN} \cdot (2{,}55 \times 10^{-2} \cdot 10)^{-1} = 10{,}196 \text{ cm}$$