Pauta Auxiliar 5 - P2

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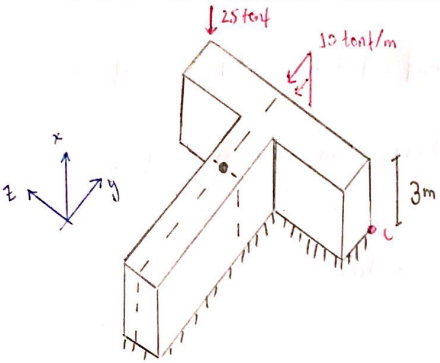
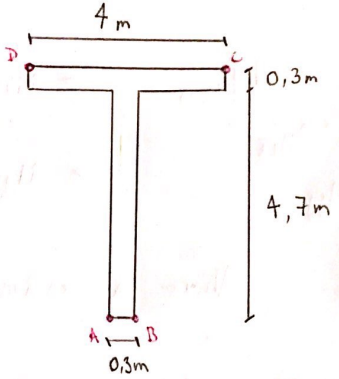
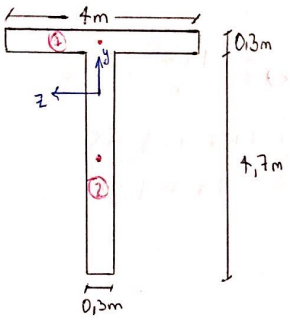




Partiremos determinando la geometría y propiedades de sección.



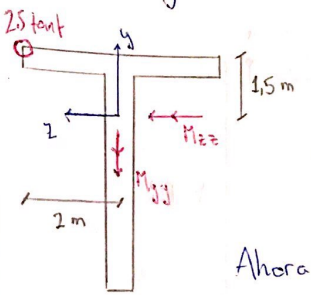
- $z_{CG} = 0$
- $y_{CG} = \dfrac{\sum A_i y_{cg_i}}{\sum A_i} = \dfrac{0,3 \cdot 4 \cdot (4,7 + 0,15) + 4,7 \cdot 0,3 \cdot 2,35}{0,3 \cdot 4 + 4,7 \cdot 0,3}$

$$\rightarrow y_{CG} = 3,5 \text{ m}$$

- $I_{zz}^{①} = \frac{1}{12} \cdot 4 \cdot 0,3^3 + 0,3 \cdot 4 \cdot (0,15 + (4,7 - 3,5))^2 = 2,196 \text{ m}^4$ ✓✓
- $I_{zz}^{②} = \frac{1}{12} \cdot 0,3 \cdot 4,7^3 + 0,3 \cdot 4,7 \cdot (3,5 - 2,35)^2 = 4,46 \text{ m}^4$ ✓✓
- $I_{yy}^{①} = \frac{1}{12} \cdot 0,3 \cdot 4^3 = 1,6 \text{ m}^4$ ✓✓ · $I_{yy}^{②} = \frac{1}{12} \cdot 4,7 \cdot 0,3^3 = 0,0106 \text{ m}^4$ ✓✓

$$\therefore \boxed{I_{zz}^{T} = 6,656 \text{ m}^4 \quad \wedge \quad I_{yy}^{T} = 1,611 \text{ m}^4}$$

Ahora buscamos los momentos, notando la existencia de una carga excentrica (produce momento):



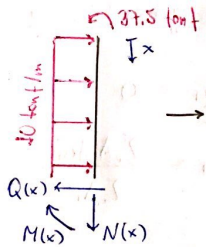
$\rightarrow M_{zz} = 25\ \text{tonf} \cdot 1{,}5\ \text{m} = 37{,}5\ \text{tonf-m}$

$\rightarrow M_{yy} = -25\ \text{tonf} \cdot 2\ \text{m} = -50\ \text{tonf-m}$

Ahora sí resolvemos la isostática:

- **AXIAL**: $N(x) = -25\ \text{tonf}$

- **MOMENTO ZZ**:

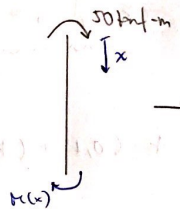


$\rightarrow M_{zz}(x) = -\frac{10x^2}{2} + 37{,}5$

$M(0) = 37{,}5\ \text{tonf-m}$

$M(3) = -7{,}5\ \text{tonf-m}$

- **MOMENTO YY**:



$\rightarrow M_{yy} = -50\ \text{tonf-m}$

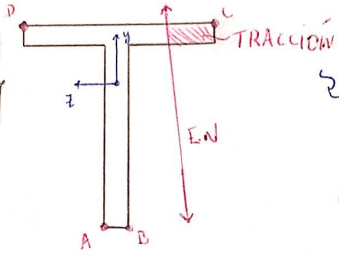
Ahora determinamos el eje neutro con la ecuación de Navier:

$$\sigma_{xx} = \frac{-25}{2{,}61} - \frac{(7{,}5)}{6{,}656}\,y + \frac{(-50)}{1{,}611}\,z \overset{!}{=} 0$$

$$\rightarrow \boxed{y(z) = 27{,}54\,(z + 0{,}3026)}$$

$z = 0 \longrightarrow y = 8{,}501\ m$

$y = 0 \longrightarrow z = -0{,}31\ m$



∴ EL HORMIGÓN NO RESISTE TRACCIÓN

∴ EL MURO FALLA !!

Ahora calculamos todas las tensiones solicitadas + enunciado:

$$\sigma_{xx}(y,z) = 1{,}127\,y - 31{,}04\,z - 9{,}579$$

- $\sigma_{xx}^{CEN}(0,0) = -9{,}58\ ton/m^2$ //
- $\sigma_{xx}^{A}(-3{,}5\ ;\ 0{,}15) = -18{,}18\ ton/m^2$ // • $\sigma_{xx}^{B}(-3{,}5\ ;\ -0{,}15) = -8{,}87\ ton/m^2$ //
- $\sigma_{xx}^{C}(1{,}5\ ;\ -2) = 54{,}19\ ton/m^2$ // • $\sigma_{xx}^{D}(1{,}5\ ;\ 2) = -69{,}97\ ton/m^2$ //