

Sol Ej Resistencia 19 Dic. 2022

$$\sum \Pi_B = 0 \rightarrow H_A \times 3 + 10V_A + 20 - 10 \times 20 \times 5$$

$$- 10 \times 6 \times 8 = 0$$

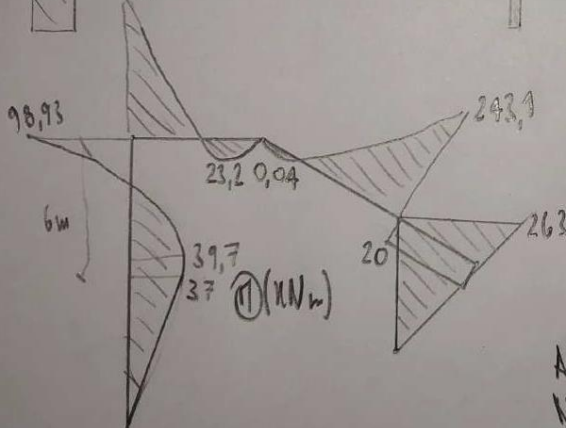
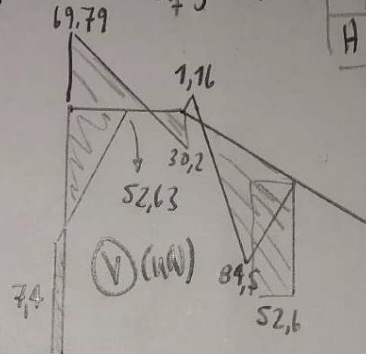
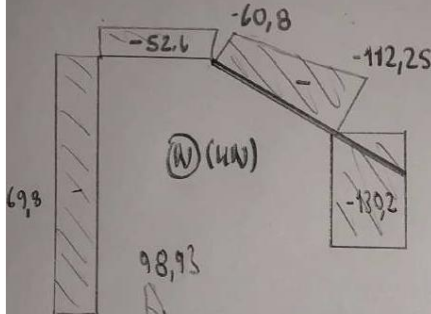
$$\rightarrow 10V_A + 3H_A = 1460$$

$$\sum \Pi_C = 0 \rightarrow 0 = 5V_A - 8H_A + 20 - 20 \times 5 \times 5$$

$$\rightarrow 5V_A - 8H_A = 230$$

$$\rightarrow V_A = 130,2 \text{ kN}; H_A = 52,63 \text{ kN}$$

Eq global  $\rightarrow V_B = 69,79 \text{ kN}$   
 $H_B = 7,37 \text{ kN}$



b) Dimensiona punto D por A

$$\Pi = 263 \text{ kNm}$$

$$N = 130 \text{ kN}$$

$$\Rightarrow \frac{\Pi}{W} \leq 140 \text{ MPa}$$

$$W > 18786 \text{ cm}^3$$

PN I 45  
 $(W = 2040 \text{ cm}^3)$

Ahora verifico con

$$N = 130,2 \text{ kN} \text{ (KPN I 45 = } 147 \text{ cm}^2)$$

$$\Rightarrow \sigma = 137,7 \text{ MPa} < 140 \text{ MPa}$$

$$c) \tau_{\max} = \frac{MV}{I_b}$$

PN I 45 + Minclasecc = 1200 cm<sup>3</sup>

b esp. alma = 1,62 cm

I = 45850 cm<sup>4</sup>

$$V_{\max} = 84,5 \text{ kN}$$

$$\tau_{\max} = 13,7 \text{ MPa}$$

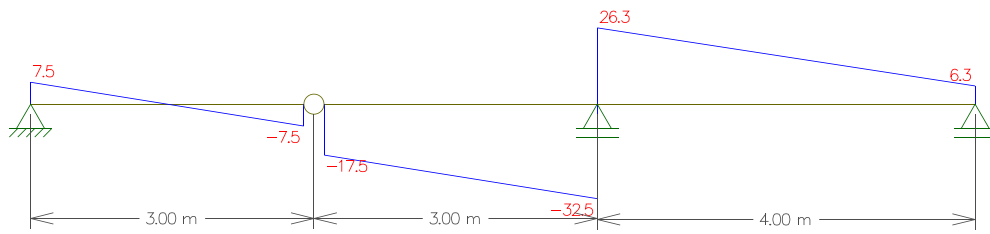
## Ejercicio 2

$$R_A = 7.5 \text{ kN}$$

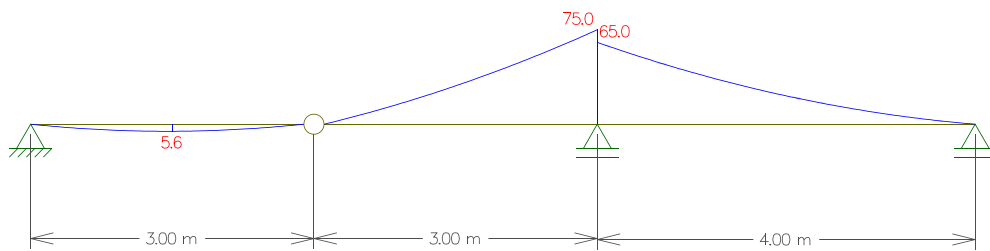
$$R_C = 58.8 \text{ kN}$$

$$R_D = -6.3 \text{ kN}$$

V(kN)



M(kNm)

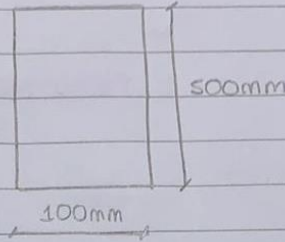


## Ejercicio 2

parte c)

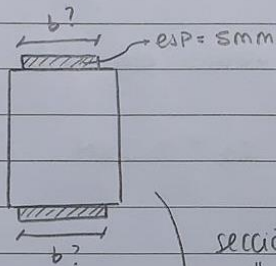
Momento máximo = 75 kNm

No hay directa



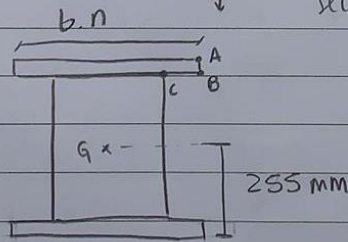
$$\sigma = \frac{M}{W} = \frac{75 \text{ kNm}}{\frac{b \cdot h^2}{6}} = \frac{75 \text{ kNm} \cdot 6}{100 \text{ mm} \cdot (500 \text{ mm})^2} = 18 \text{ MPa} > 15 \text{ MPa}$$

Refuerzo con 2 chapas metálicas



$$n = \frac{E_{\text{acero}}}{E_{\text{madera}}} = \frac{210 \text{ GPa}}{10,5 \text{ GPa}} = 20$$

sección homogeneizada  
("agrandando" partes de acero)  
sección completamente de madera



$$I_h = 2 \left( \frac{b \cdot 20 \cdot (0,005 \text{ m})^3}{12} + b \cdot 20 \cdot 0,005 \text{ m} \cdot (0,0025 \text{ m} - 0,255 \text{ m})^2 \right) + \frac{0,1 \text{ m} \cdot (0,5 \text{ m})^3}{12} = 4,167 \times 10^{-7} b + 0,01275 \cdot b + 1,04167 \times 10^{-3}$$

Flex

$$\sigma_A = \frac{M \cdot y \cdot n}{I_n} = \frac{75 \text{ kNm} \cdot 0,255 \text{ m} \cdot 20}{I_n} \leq 140 \text{ MPa}$$

$$I_n \geq 2,732 \times 10^{-3} \text{ m}^4$$

$$b \geq 0,133 \text{ m}$$

$$\rightarrow \text{TOMO } b = 14 \text{ CM}$$

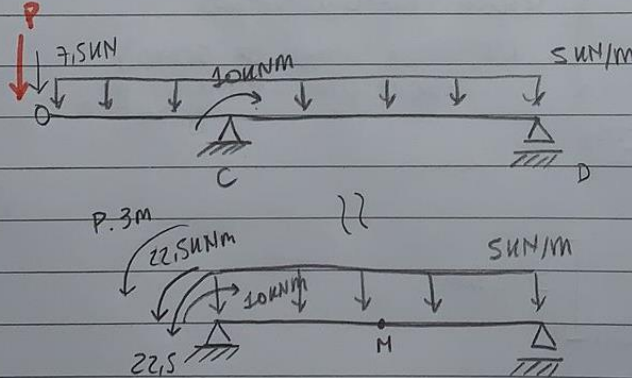
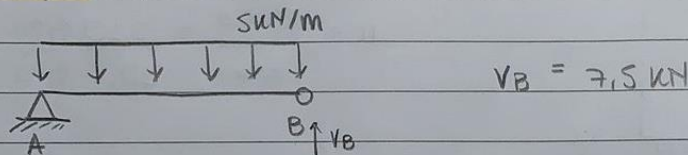
$$\Rightarrow I_n = 2,8269 \times 10^{-3} \text{ m}^4$$

$$\sigma_B = \frac{M \cdot y \cdot n}{I_n} =$$

$$= \frac{75 \text{ kNm} \cdot (0,255 \text{ m} - 0,005 \text{ m}) \cdot 20}{2,8269 \times 10^{-3} \text{ m}^4} = 132,65 \text{ MPa} \leq 140 \text{ MPa} \quad \checkmark$$

$$\sigma_c = \frac{M \cdot y}{I_n} = \frac{75 \text{ kNm} \cdot (0,255 - 0,005) \text{ m}}{2,8269 \times 10^{-3} \text{ m}^4} = 6,63 \text{ MPa} \leq 15 \text{ MPa} \quad \checkmark$$

Parte d) FLECHA EN PUNTO MEDIO DE CD



Flex

$$q \rightarrow \delta_M = \frac{5q l^4}{384 EI} \downarrow$$

$$M \rightarrow \delta_M = \frac{3S \text{ kNm} \cdot l^2}{16 EI} \uparrow$$

$$P \rightarrow \delta_M = \frac{3M \cdot P \cdot l^2}{16 EI} \uparrow$$

Papiror

positivo  
karena abeto

$$\delta_M = \frac{5q l^4}{384 EI} - \frac{35 \text{ kNm} \cdot l^3}{10 EI} - \frac{3 \cdot P l^3}{16 EI} = 0$$

$$\frac{5q l^4}{384} - \frac{35 \text{ kNm}}{16} - \frac{3P}{16} = 0$$

$$P = \underline{\underline{-6,111 \text{ kN}}}$$