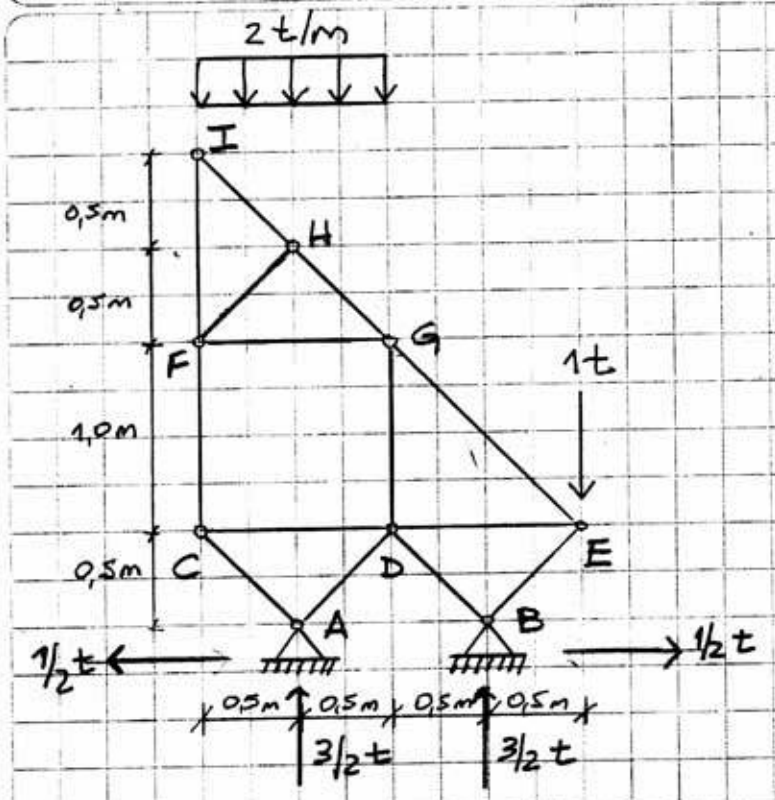
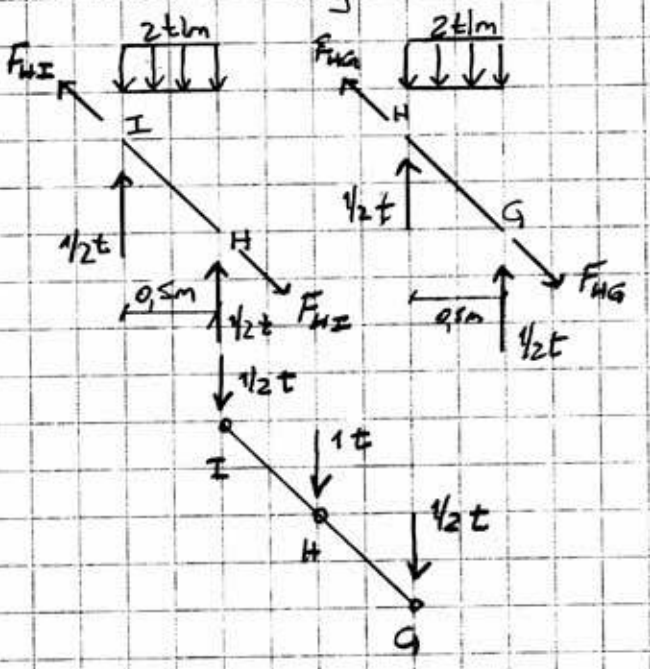
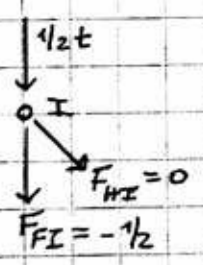
Ejercicio 1 — Resistencia de Materiales 1 — 20/02/2009



Se lleva la carga a los nodos



NUDO I



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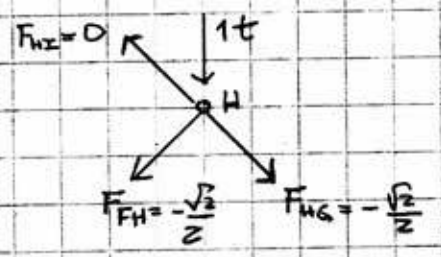
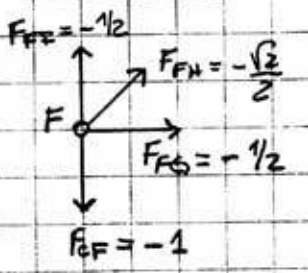
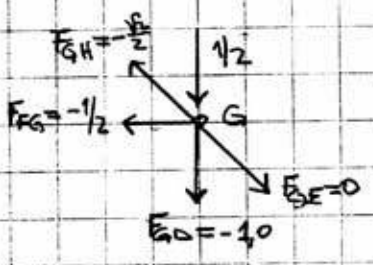


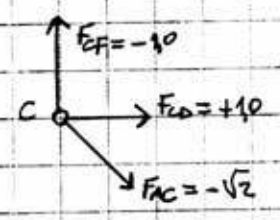
NUDO F



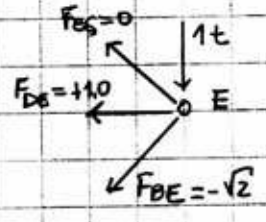
NUDO G



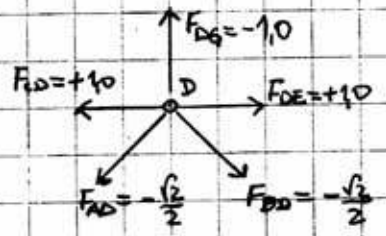
NUDO C



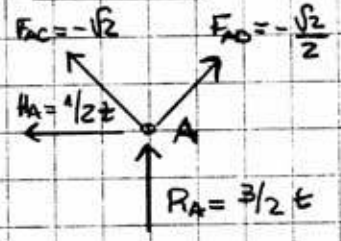
NUDO E



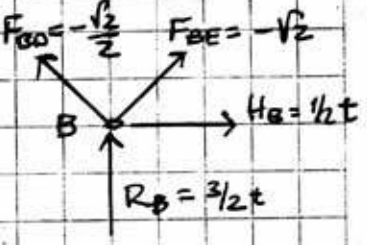
NUDO D



NUDO A

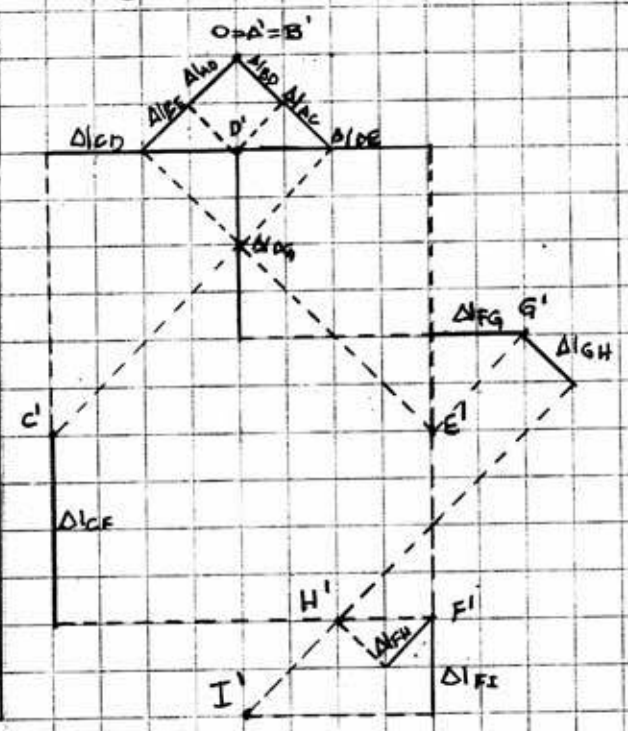


NUDO B



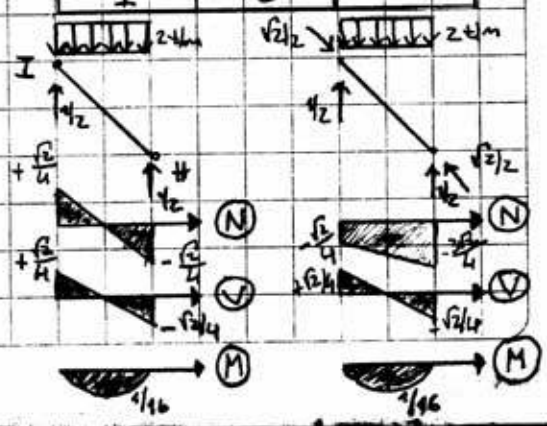
BARRA	L	F	AE/L	ΔL E/Ω
AC	√2/2	-√2	√2 Ω	-√2/2
AD	√2/2	-√2/2	√2 Ω	-√2/4
BD	√2/2	-√2/2	√2 Ω	-√2/4
BE	√2/2	-√2	√2 Ω	-√2/2
CD	1	+1	Ω	+1
DE	1	+1	Ω	+1
CF	1	-1	Ω	-1
DG	1	-1	Ω	-1
EG	√2	0	√2 Ω	0
FG	1	+1/2	Ω	+1/2
FH	√2/2	-√2/2	√2 Ω	-√2/4
GH	√2/2	-√2/2	√2 Ω	-√2/4
FI	1	-1/2	Ω	-1/2
HI	√2/2	0	√2 Ω	0

DIAGRAMA DE WILLIOT

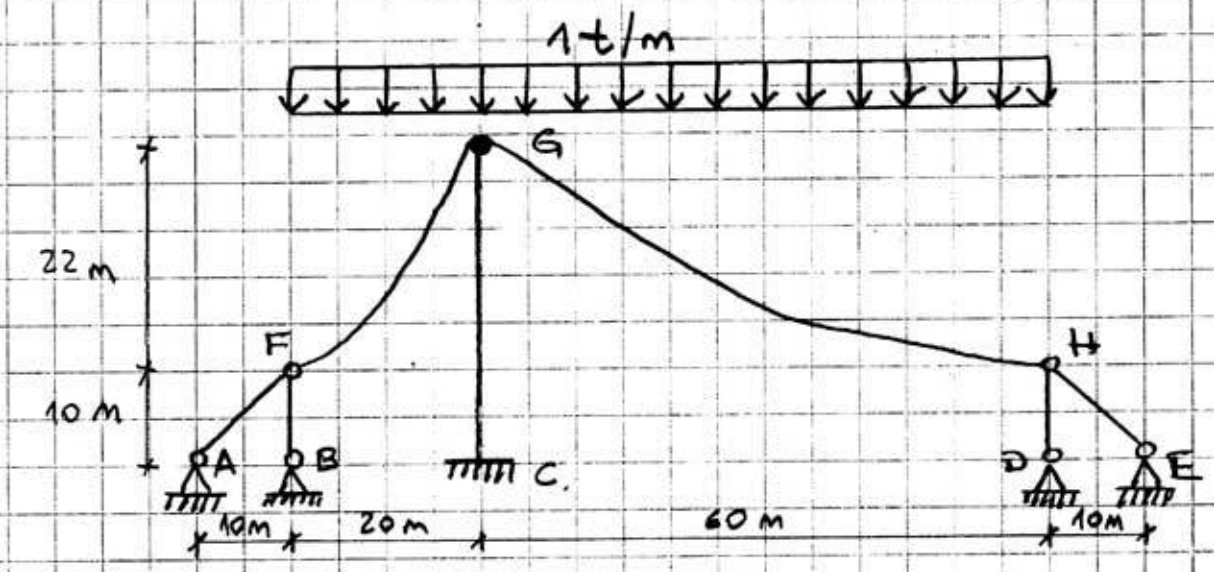


DESPLAZAMIENTOS

NODO	δx → E Ω/(t·m)	δy ↓ E Ω/(t·m)
A	0	0
B	0	0
C	-1,0	-2,0
D	0	-0,5
E	1,0	2,0
F	1,0	3,0
G	1,5	1,5
H	0,5	3,0
I	0	3,5



Ejercicio 2 | Resistencia de Materiales 1 | 20/02/2008



En cable GH $\Rightarrow$ $H = \frac{85\sqrt{2}}{2} = 60{,}1\ t \Rightarrow \underline{H = 60{,}1\ t}$

$y = \frac{px^2}{2H} - x\,tg\alpha_0 \Rightarrow -22 = \frac{1 \cdot 60^2}{2 \cdot 60{,}1} - 60\,tg\alpha_0 \Rightarrow \underline{\alpha_0^{GH} = 40{,}9°}$

$T_G = \frac{H}{\cos\alpha_0} \Rightarrow T_G = \frac{60{,}1}{\cos 40{,}9} = 79{,}5\ t \Rightarrow \underline{T_G^{GH} = 79{,}5\ t}$

En cable FG $\Rightarrow$ Polea sin rozamiento $\Rightarrow T_G^{FG} = T_G^{GH} = 79{,}5\ t$

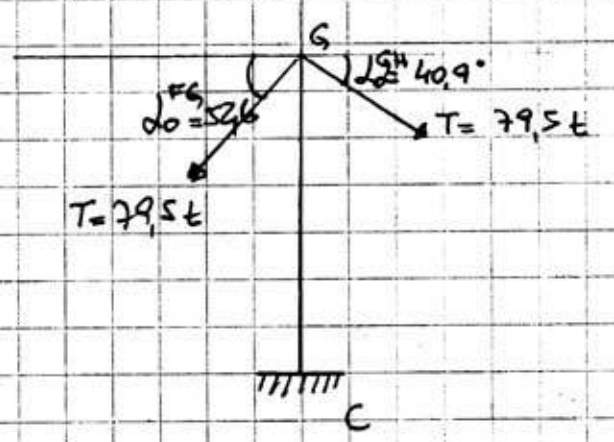
$\Rightarrow y = \frac{px^2}{2H} - x\,tg\alpha_0 \Rightarrow -22 = \frac{1 \cdot 20^2}{2T\cos\alpha_0} - 20\frac{\operatorname{sen}\alpha_0}{\cos\alpha_0} \Rightarrow$

$T\cos\alpha_0 = H$

$\Rightarrow -22\cos\alpha_0 = 2{,}51 - 20\operatorname{sen}\alpha_0 \Rightarrow \operatorname{sen}\alpha_0 = 0{,}126 + 1{,}1\cos\alpha_0$

$\Rightarrow 1 - \cos^2\alpha_0 = 0{,}016 + 1{,}21\cos^2\alpha_0 + 0{,}277\cos\alpha_0 \Rightarrow$

$\Rightarrow 2{,}21\cos^2\alpha_0 + 0{,}277\cos\alpha_0 - 0{,}984 = 0 \Rightarrow \cos\alpha_0 = 0{,}607 \Rightarrow \underline{\alpha_0^{FG} = 52{,}6°}$



$\vec{F}_G = 79{,}5(\cos 40{,}9 - \cos 52{,}6) = 11{,}8\ t$

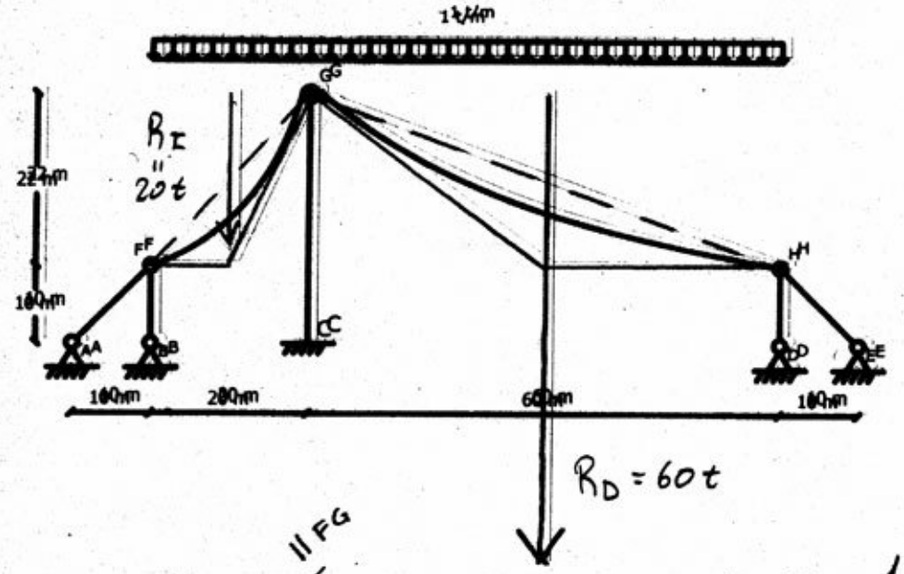
$\vec{f}_G = \frac{PL^3}{3EI} = \frac{11{,}8 \cdot 1000 (32 \cdot 100)^3}{3 \cdot 3{,}0\times10^5\ I} = 5$

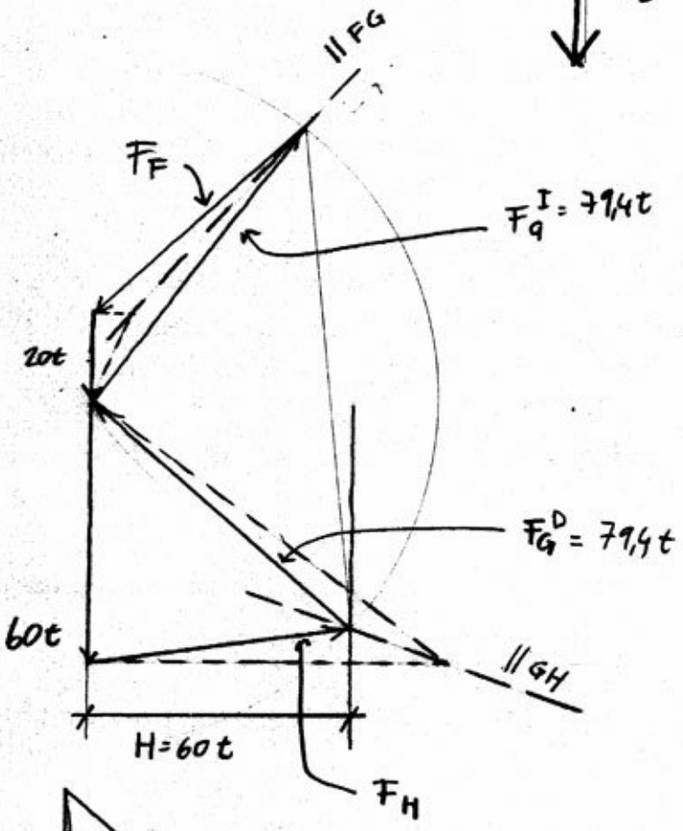
$\Rightarrow I = 0{,}86\ m^4 = \frac{\pi h^4}{64}$

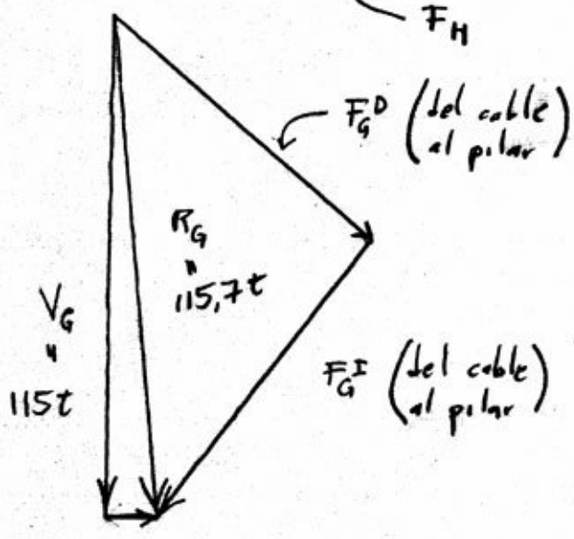
$h = \sqrt[4]{\frac{64 \cdot 0{,}86}{\pi}} = 2{,}0\ m$

$\Rightarrow \boxed{h = 2{,}05\ m}$

Sol. Ej: 2



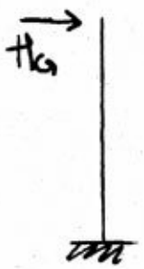




$H_G = 11,8\,t$

$H = F_{HE} \cdot \frac{1}{\sqrt{2}} = 85\,t \times \frac{1}{\sqrt{2}} = 60\,t$

Dimensionado



$$\delta = \frac{PL^3}{3EI} = \frac{11{,}8 \times 1000 \times (32 \times 100)^3}{3 \times 3 \times 10^5 \times \frac{\phi^4 \pi}{64}} \leq 5$$

$$I = \frac{\pi \phi^4}{64}$$

$\phi \geq 205$ cm.

Ej: 3

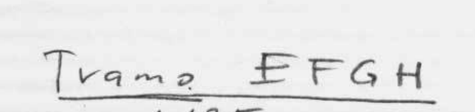
EFGH, $\Sigma H = 0 \Rightarrow H_G = 0$

ABCD, $\Sigma H = 0 \Rightarrow H_B = 0$

eq. Global: $\Sigma M_B = 0 \Rightarrow 0{,}5\,t/m \cdot 5m \; 1{,}5m + 1{,}5t \cdot 2m = V_G \cdot 3m \Rightarrow \underline{V_G = 2{,}25t}$

$\Sigma V = 0 \Rightarrow 0{,}5\,t/m \; 5m + 1{,}5\,t - 2{,}25t = V_B \Rightarrow \underline{V_B = 1{,}75\,t}$

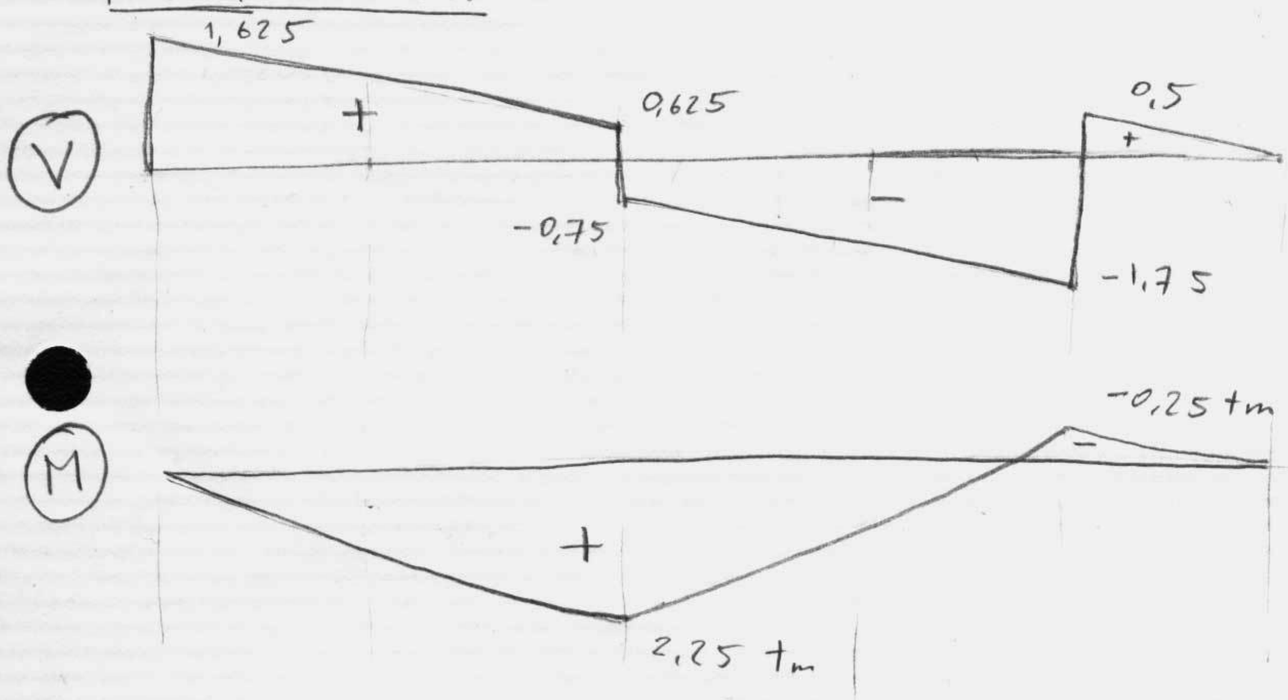
EFGH



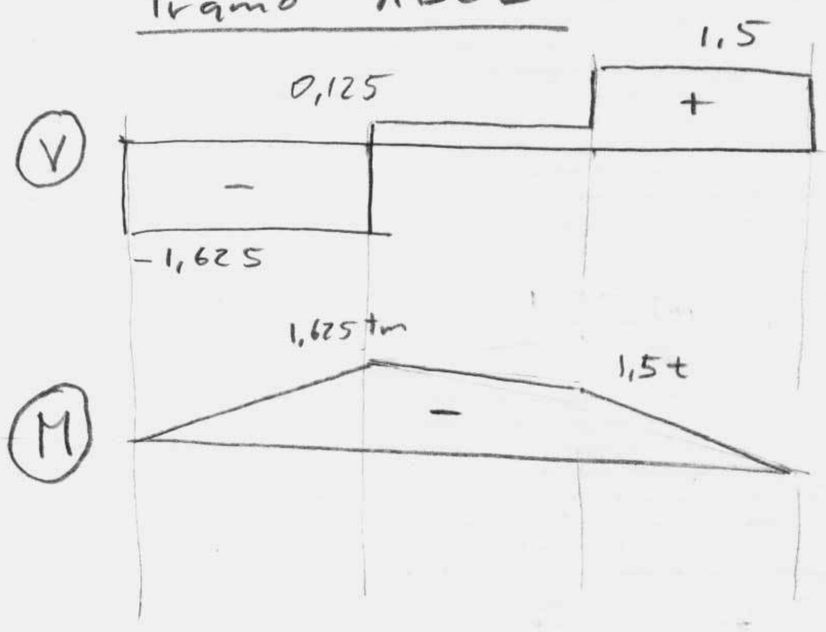
$\Sigma M_E = 0 \Rightarrow 0{,}5\,t/m \cdot \frac{(5m)^2}{2} - 2{,}25t \cdot 4m = F_{FC} \cdot 2m \Rightarrow \underline{F_{FC} = 1{,}375\,t}$

$\Sigma V = 0 \Rightarrow 0{,}5\,t/m \; 5m + 1{,}375\,t - 2{,}25t = F_{AE} \Rightarrow \underline{F_{AE} = 1{,}625\,t}$

Tramo EFGH



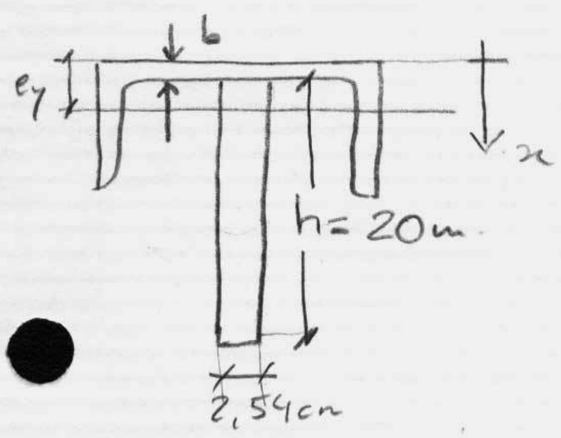
Tramo ABCD



Tramos: EA, solo directa. $N_{EA} = -1{,}625t$ (compresión)

FC, solo directa $N_{FC} = 1{,}375$ (tracción)

Sección



PNC16 $\Rightarrow$ $b = 0{,}75\,cm$ $A = 24\,cm^2$ $e_y = 1{,}84$ $I_y = 85{,}3\,cm^4$

$$x_G = \frac{24 \cdot 1{,}84 + (20 \times 2{,}54)(0{,}75 + 10)}{24 + (20\,2{,}54)} = 7{,}89\,cm^2$$

$\begin{cases} y_{sup} = x_G \\ y_{inf} = h + b - x_G \end{cases}$

$$I_y = 85{,}3 + \frac{2{,}54\,20^3}{1} + 24 \cdot (x_G - 1{,}84)^2 + 2{,}54 \cdot 20\,(10 + 0{,}75 - x_G)^2$$

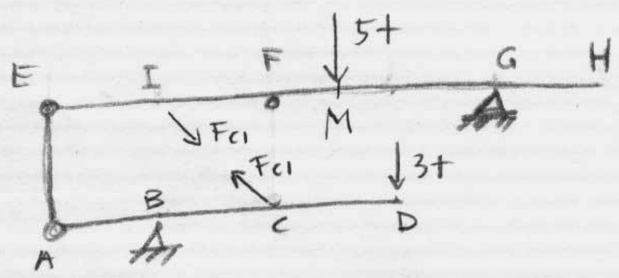
$$= 3072{,}6\,cm^4$$

$$\sigma^{sup}_{comp} = \frac{M_{inf}}{W_{sup}} = \frac{2{,}25 \times 100 \times 7{,}89}{3072{,}6} = 0{,}58\ t/m^2 \qquad \sigma^{inf}_{comp} = \frac{M_{sup}}{W_{inf}} = \frac{1{,}625 \times 100 \times 12{,}86}{3072{,}6} = \underline{0{,}68\,t/m^2}$$

$$\sigma^{inf}_{tracción} = \frac{M_{inf}}{W_{inf}} = \frac{2{,}25 \times 100 \times \overbrace{(20 + 0{,}75 - 7{,}89)}^{12{,}86}}{3072{,}6} = \underline{0{,}94\ t/m^2}$$

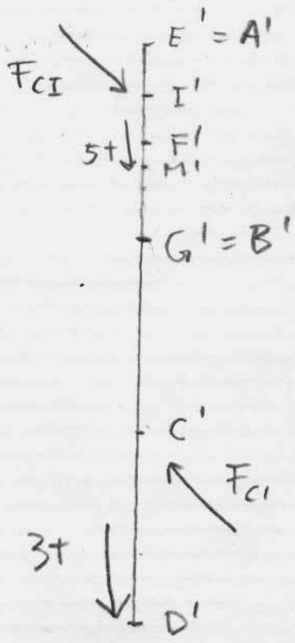
Barra en CI

USO P.T.V. saco barra CI y pongo Fuerza F_{CI}



Diag. de desplaz: (impongo δ_D)

$\delta_D = 1 \Rightarrow$ $\delta_C = 1/2$, $\delta_E = 1/2$, $\delta_I = 1/2 \cdot 3/4$, $\delta_M = 1/2\ 3/8$



$\Sigma \delta W = 0$

$$-\delta_C \cdot \frac{F_c}{\sqrt{2}} - \delta_I \frac{F_{CI}}{\sqrt{2}} - \delta_M 5t + \delta_D 3t = 0$$

$$\left(-\tfrac{1}{2} \cdot \tfrac{1}{\sqrt{2}} - \tfrac{3}{8} \tfrac{1}{\sqrt{2}}\right) F_{CI} - \tfrac{3}{16} 5t + 3t = 0$$

$$\Rightarrow F_{CI} = \frac{-2{,}063}{-0{,}619} = 3{,}33\,t$$