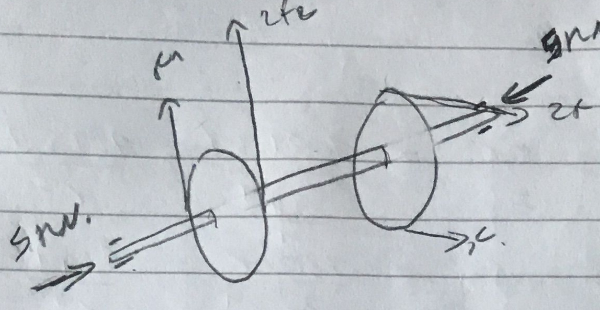
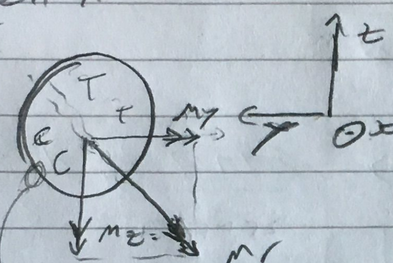


Como se somete a directa los diagramas de cortante y flector quedan iguales y el punto mas comprometido sigue siendo ⓐ

sección en A

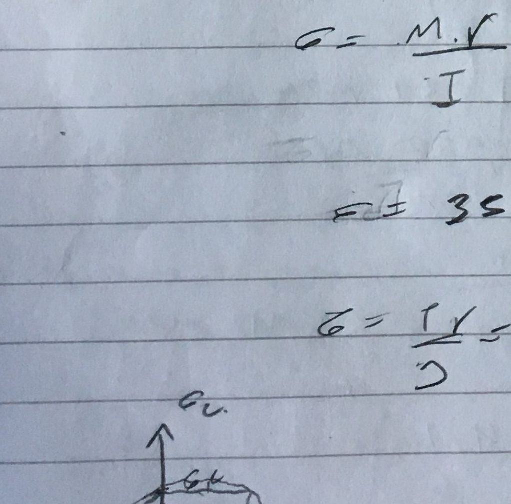


dentro de la sección este va a ser el punto mas comprometido donde se suman el esfuerzo de compresión por directa y el esfuerzo de compresión por Mr.

$$\sigma = \frac{M \cdot r}{I} + \frac{P}{A} = \frac{1004,3 \cdot 0,035}{\frac{\pi\, 0,035^4}{4}} + \frac{5000}{\frac{\pi\, 0,035^2}{4}}$$

$$= \pm\, 35,021 \text{ MPa}$$

$$\tau = \frac{T r}{J} = \frac{130 \cdot 0,035}{\frac{0,035^4 \pi}{2}} = 1,930 \text{ MPa}$$



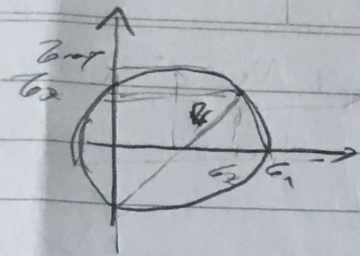
criterio mas conservador es tresca

$$FS = \frac{\sigma_e}{2\tau_{max}}$$

$$\boxed{FS = 3,56}$$

se puede seguir operando

$$\tau_{max} = \sqrt{\left(\frac{\sigma_x}{2}\right)^2 + \tau_{xy}^2} = 17,51 \text{ MPa}$$



$$\sigma_x = \frac{Mr}{I} = \frac{1004{,}3\,r}{\frac{\pi r^4}{4}} = \frac{1278{,}7}{r^3}$$

$$\tau_{xy} = \frac{Tr}{J} = \frac{130 \cdot r}{\frac{\pi r^4}{2}} = \frac{82{,}76}{r^3}$$

$$\tau_{max} = R = \sqrt{\left(\frac{\sigma_x}{2}\right)^2 + \tau_{xy}^2} = \frac{644{,}7}{r^3} \text{ Pa}$$

Tresca $\quad \tau_{max} \leq \dfrac{\sigma_F}{2 F_S}$

$F_S = 4$

$\sigma_F = 125$ MPA $\quad \Rightarrow \quad \dfrac{644{,}7}{r^3} \leq \dfrac{125 \times 10^6}{2 \cdot 4}$

$$r \geq \sqrt[3]{\frac{649{,}8}{125 \times 10^6} \cdot 8} = 0{,}035 \text{ m}$$

Von mises

$$\sigma_1 = \frac{\sigma_x}{2} + \sqrt{\left(\frac{\sigma_x}{2}\right)^2 + \tau_{xy}^2}$$

$$\sigma_2 = \frac{\sigma_x}{2} - \sqrt{\left(\frac{\sigma_x}{2}\right)^2 + \tau_{xy}^2}$$

$r = 0{,}035$ m $\rightarrow$ $\sigma_x = 29{,}824$ MPA

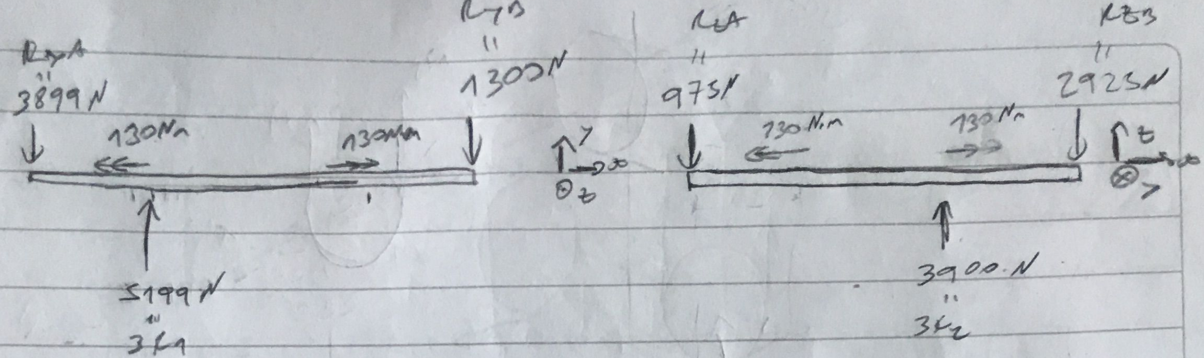
$\tau_{xy} = 1{,}930$ MPA

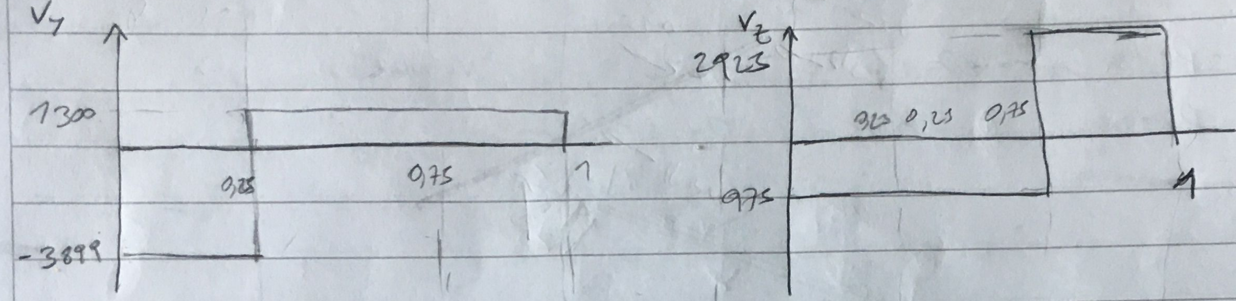
$\sigma_1 = 29{,}95$ MPA

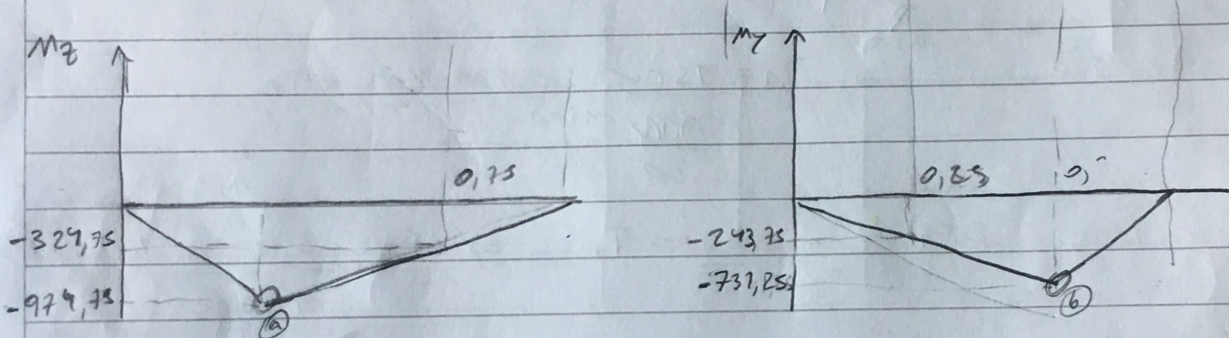
$\sigma_2 = -0{,}124$ MPA

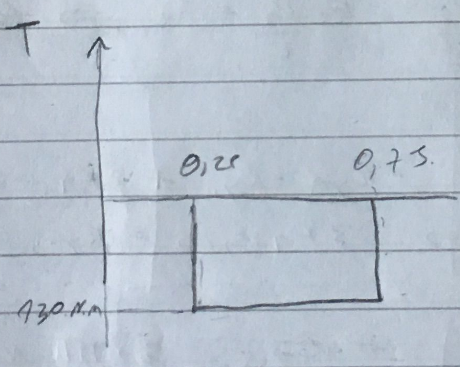
$$\sigma_{eq} = \sqrt{\sigma_1^2 + \sigma_2^2 - \sigma_1 \sigma_2} = 30{,}01 \text{ MPA}$$

$$F_S = \frac{\sigma_F}{\sigma_{eq}} = \frac{125}{32{,}76} = 4{,}1$$









Ptos mas comprometidos

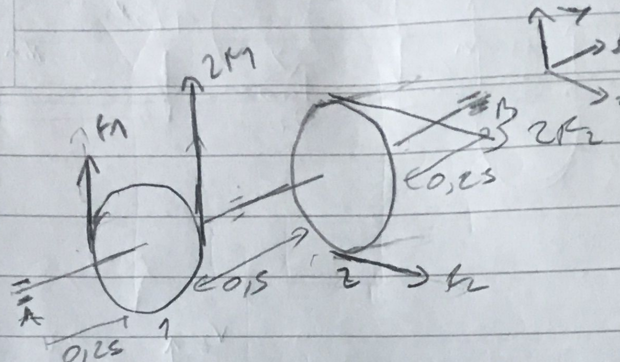
a $M_f = \sqrt{(977,75)^2 + (243,75)^2} = 1004,3$ Nm

$T = 130$ N.m

b $M_f = \sqrt{(324,75)^2 + (731,25)^2} = 800,1$ N

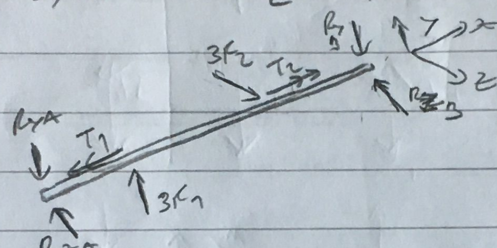
$T = 130$ N.m

$\Rightarrow$ Pto mas comprometido a (polea 1)



Potencia 20 hp $\simeq$ 15 Kw. N= 1100 RPm

D polea $D_1 = 0{,}15\,m$ $D_2 = 0{,}2\,m$.



$P = T\omega \Rightarrow T_1 = \dfrac{15\,kw}{\dfrac{2\pi N}{60}}$ $N=1100$ $= 130\ Nm = T_2$

Polea 1 $\Rightarrow 2F_1 \dfrac{D_1}{2} - F_1 \dfrac{D_1}{2} = T_1 \Rightarrow F_1 = \dfrac{2}{D_1} \overset{130}{T_1} = 1733\ N$ $D_1 = 0{,}15$

Polea 2 $2F_2 \dfrac{D_2}{2} - F_2 \dfrac{D_2}{2} = T_2 \Rightarrow F_2 = \dfrac{2.130}{0{,}2} = 1300\ N$

$\Sigma F_y = 0 \Rightarrow -R_{yA} - R_{yB} + 3F_1 = 0$

$\Sigma M_{z\,pto A} = 0 \Rightarrow 3F_1 . 0{,}25 = R_{yB} . 1 \Rightarrow R_{yB} = 3.1733 . 0{,}25$

$R_{yB} = 1300\ N$

$R_{yA} = 3899\ N$

$\Sigma F_z = 0 \Rightarrow -R_{zA} - R_{zB} + 3F_2 = 0$

$\Sigma M_{y\,pto A} = 0 \Rightarrow 3F_2 . 0{,}25 = R_{zB} . 1 \Rightarrow R_{zB} = 2925\,N$

$\Rightarrow R_{zA} = 3.1300 - 2925$

$R_{zA} = 975\ N$