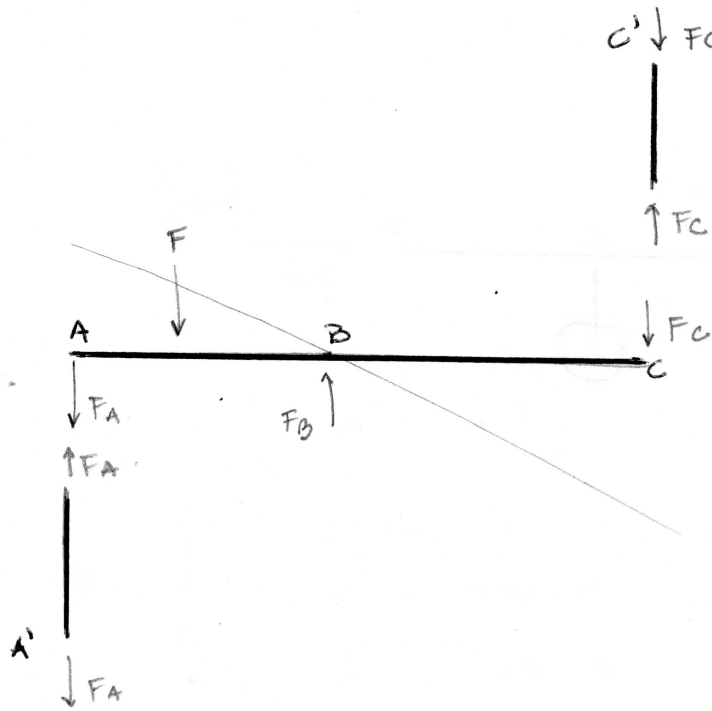


Problema 1:

DCL



$$\sum M_B = 0 \Rightarrow F_A + \frac{F}{2} = F_c$$

Condición deformación  $\Rightarrow \delta_A = \delta_c$

$$\delta_A = \frac{F_A \cdot L}{AE}$$

$$\delta_c = \alpha \cdot \Delta T \cdot L - \frac{F_c L}{AE}$$

$$F_c = 23,8 \text{ kN}$$

$$F_A = 14,164 \text{ kN}$$

$$\delta_c = -75,817 \mu\text{m}$$

$$\delta_A = 45,117 \mu\text{m}$$

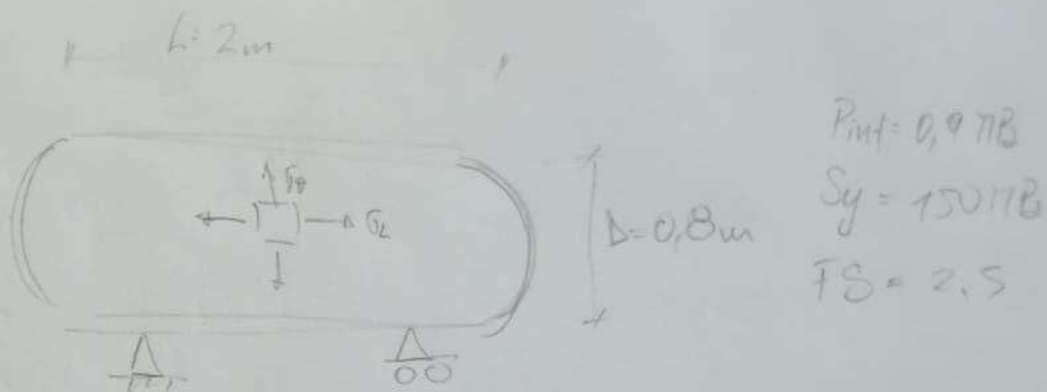
Si  $F_A = 0 \text{ N} \Rightarrow F_c = \frac{F}{2} = 9,635 \text{ kN}$

$$\delta_c \text{ ahora} = \delta_{temp} - \delta_{F_c} = 9,29 \times 10^{-4} \text{ m}$$

$$\delta_A = \delta_c = \alpha \cdot \Delta T \cdot L$$

$$\Delta T = 37,3^\circ\text{C}$$

## Ejercicio 2



Asumiendo  $D \gg r \rightarrow \sigma_r = 0 \rightarrow \sigma_c = \frac{PD}{2 \cdot 2t}$

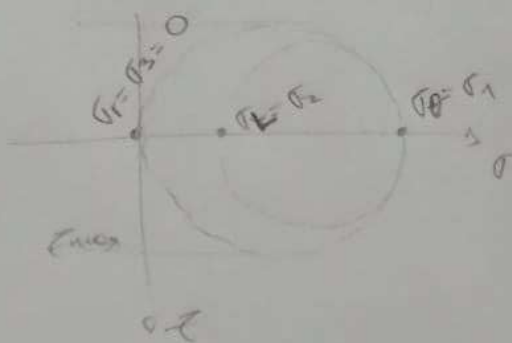
$$\rightarrow \sigma_\theta = \frac{PD}{2t}$$

$$\sigma_c = \sqrt{\sigma_r^2 + \sigma_\theta^2 - \sigma_r \sigma_\theta} \leq \frac{S_y}{FS}$$

$$= \frac{PD}{2t} \sqrt{\left(\frac{1}{2}\right)^2 + 1^2 - \frac{1}{2}} \leq \frac{S_y}{FS} \Rightarrow t \geq \frac{PD \sqrt{3} \cdot FS}{1.4 S_y} = 5.2 \times 10^{-3}\text{ m}$$

"  $\sqrt{3}/2$  "

$$t \geq 5.2\text{ mm}$$

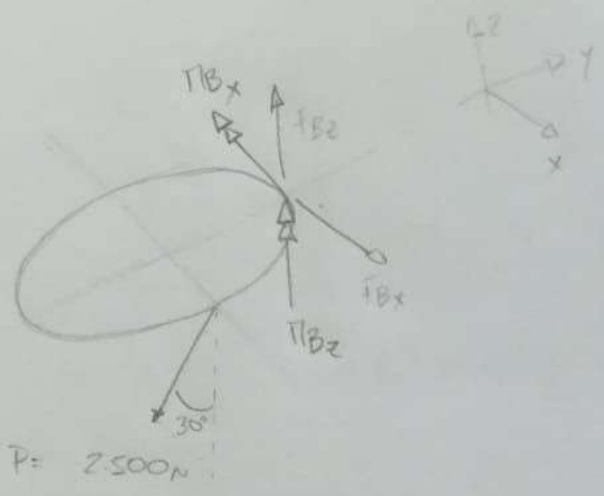


$$\tau_{max} = \frac{\sigma_\theta}{2} = \sigma_c = 34.6\text{ MPa}$$

# EXAMEN-FEB21-TIM52

## Ejercicio 1

1)



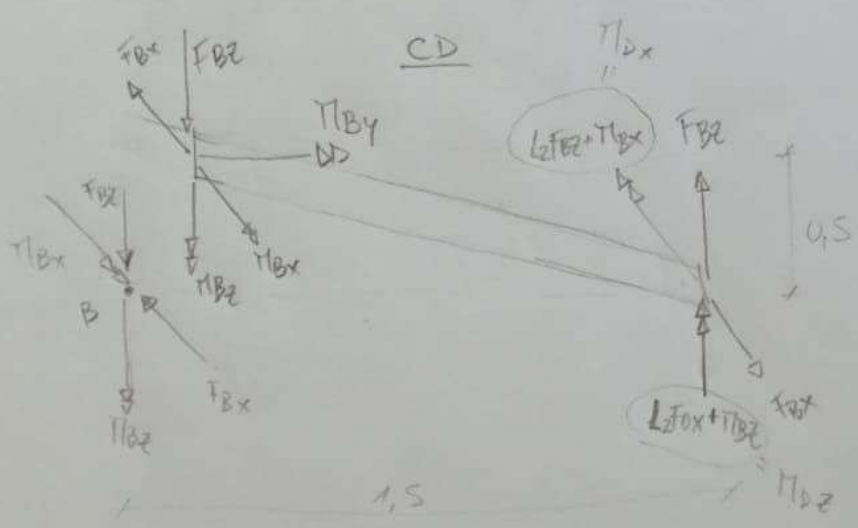
$$\Rightarrow M_{Bx} = P \cos(30) \frac{d}{2} = 487,13 \text{ N}$$

$$\rightarrow M_{Bz} = P \sin(30) \frac{d}{2} = 281,25 \text{ N}\cdot\text{m}$$

$$\Rightarrow F_{Bz} = P \cos(30) = 2165 \text{ N}$$

$$\Rightarrow F_{Bx} = P \sin(30) = 1250 \text{ N}$$

2)

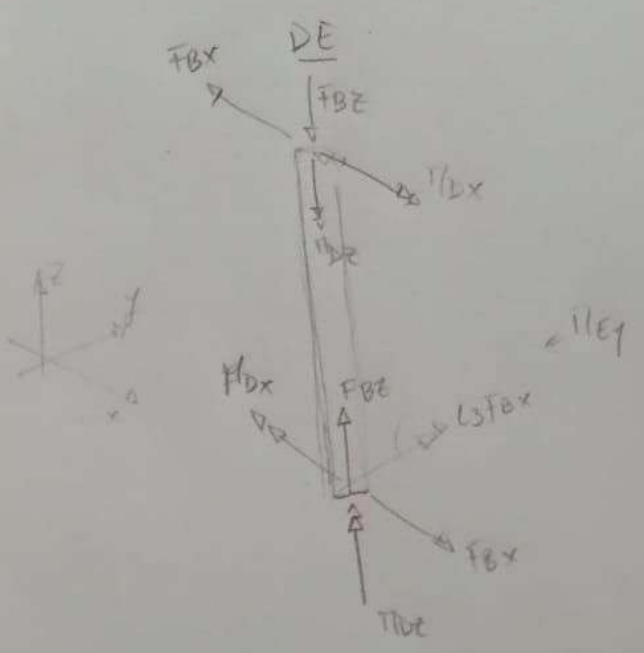


$$M_{By} = F_{Bx} \cdot L = 625 \text{ N}$$

$$M_{Dx} = 3734,6 \text{ N}\cdot\text{m}$$

$$M_{Dz} = 2156,25 \text{ N}\cdot\text{m}$$

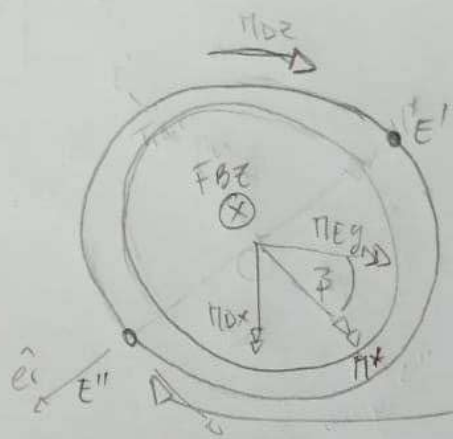
$$M_{Ey} = L_2 F_{Bx} = 3750 \text{ N}\cdot\text{m}$$



3)

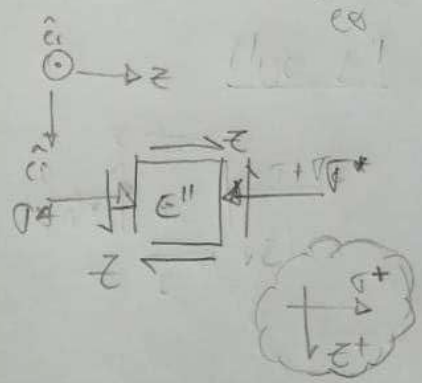


$$\beta = \tan^{-1} \left( \frac{\pi D x}{\pi E y} \right) = 44,9^\circ$$



$$\pi^* = \sqrt{\pi E y^2 + \pi D x^2} = 5292,4 \text{ N.m}$$

$E''$  es el  $\oplus$  comprimido, pues: comp x directo + comp x flexión.



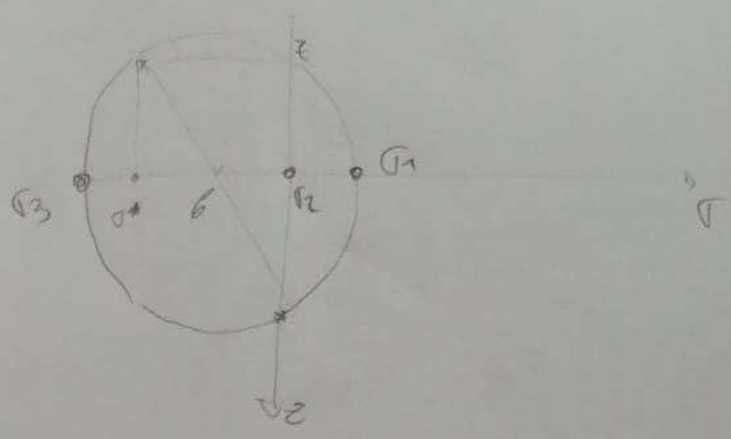
$$\sigma^* = \frac{\pi^* r}{I} + \frac{F_{0z}}{\Delta} = 13,86 \text{ MPa}$$

$$\tau = \frac{\pi D z \cdot r}{2I} = 2,57 \text{ MPa}$$

$$I = \frac{\pi (a^4 - (a-2c)^4)}{4} = 3,14 \times 10^{-5} \text{ m}^4$$

$$\Delta = 1,77 \times 10^{-3} \text{ m}^2$$

4)



$$s) \sigma = \frac{V}{z} = -6,93 \text{ MPa}$$

$$\tau_{max} = \sqrt{(\sigma - \sigma_1)^2 + \tau^2}$$

$$\tau_{max} = 7,39 \text{ MPa}$$

$$\sigma_1 = \tau_{max} \Rightarrow \sigma_1 = \sigma + \tau_{max}$$

$$\sigma_1 = 0,46 \text{ MPa}$$

$$\sigma_2 = 0$$

$$\sigma_3 = \sigma - \tau_{max}$$

$$\sigma_3 = 14,32 \text{ MPa}$$