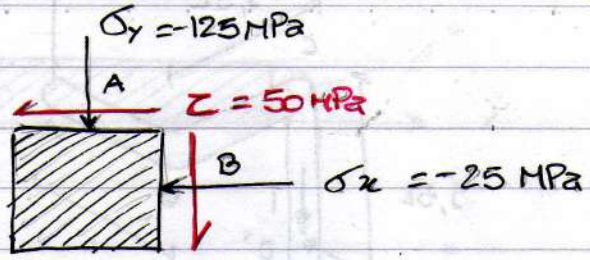
2°P 2023

Ejercicio 1



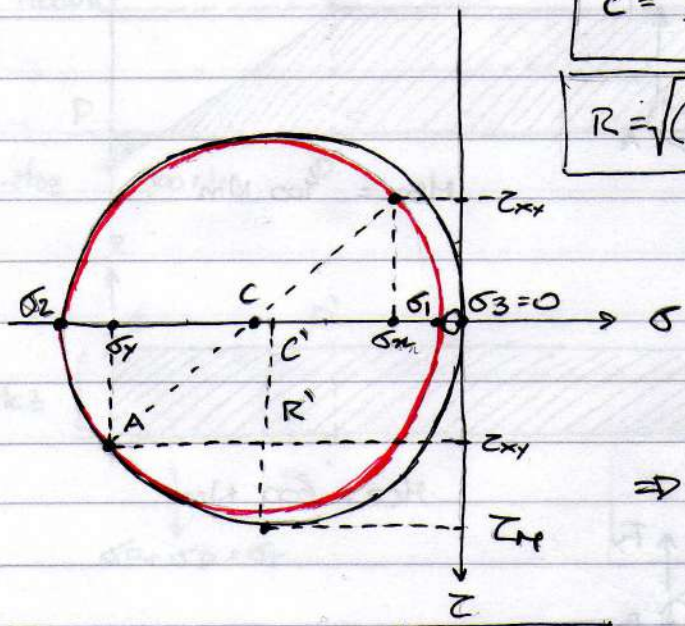
$S_y = 145$ MPa

$$FS_{3k} = \frac{S_y}{2\tau_M}$$

$$FS_{VM} = \frac{S_y}{\sigma_{VM}} \Rightarrow \sigma_{VM} = \sqrt{\frac{(\sigma_1-\sigma_2)^2 + \sigma_2^2 + \sigma_1^2}{2}} = 143,61 \text{ MPa}$$

$$C = \frac{\sigma_x + \sigma_y}{2} = -75 \text{ MPa}$$

$$R = \sqrt{(\sigma_y - C)^2 + \tau^2} = 70,71 \text{ MPa}$$



$\sigma_1 = C + R = -4,29$ MPa

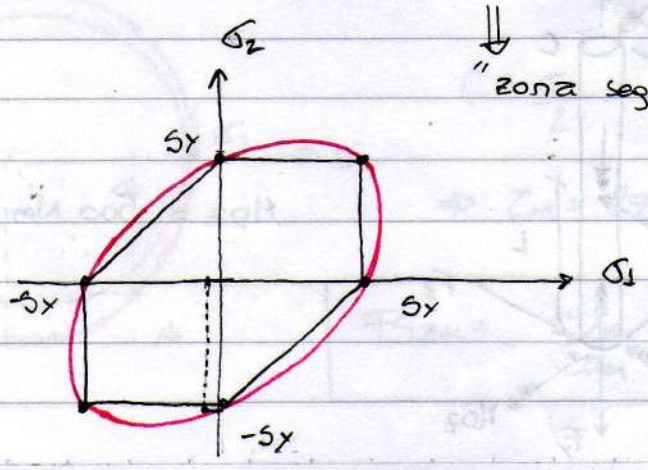
$\sigma_2 = C - R = -145,71$ MPa

$$\Rightarrow \tau_M = \frac{\sigma_2}{2} = R' = 72,86 \text{ MPa}$$

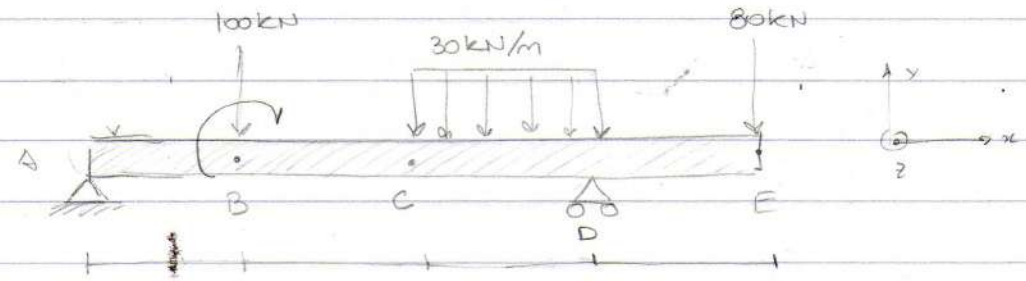
$$\Rightarrow FS_{3k} = \frac{145 \text{ MPa}}{145,71 \text{ MPa}} = 0,995 \quad , \quad FS_{VM} = \frac{145}{143,61} = 1,01$$

⇓ Falla

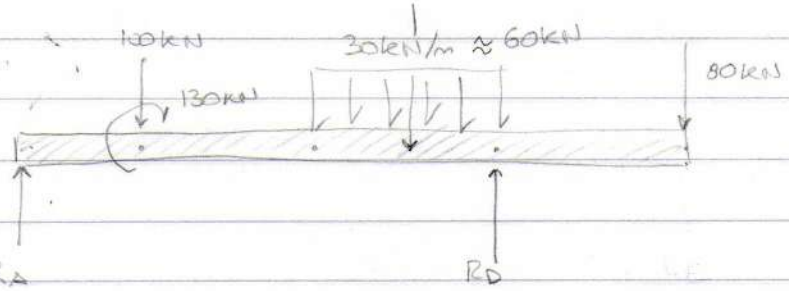
⇓ "zona segura"



Problema 2



DCL ABCDE



$\Sigma F_y = 0 \iff R_A + R_D = 100\,kN + 60kN + 80\,kN$

$$R_A + R_D = 240\,kN \quad (1)$$

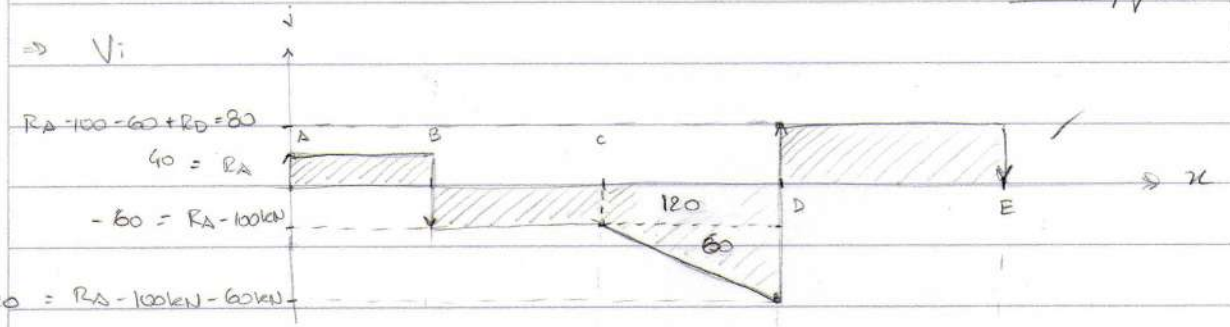
$\Sigma M_B = 0 \iff 130\,kNm + R_A \cdot 2m + 60kN \times 3{,}5m + 80kN \times 6m = R_D \cdot 4{,}5m$

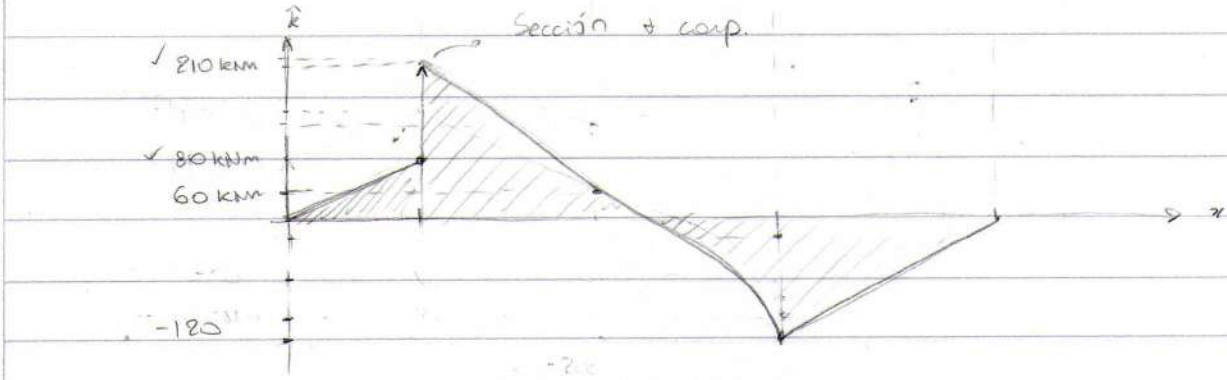
$$2R_A - 4{,}5R_D = -820\,kNm \quad (2)$$

$\Rightarrow (1), (2) \Rightarrow$ $R_A = 40\,kN$, $R_D = 200\,kN$

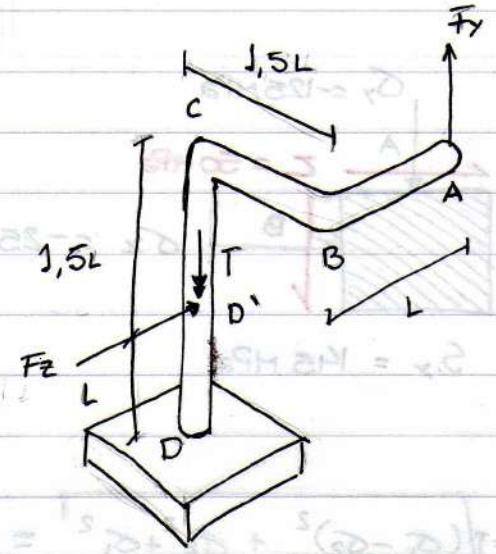
$V+(-\hat{j})$ $M+(\hat{k})$

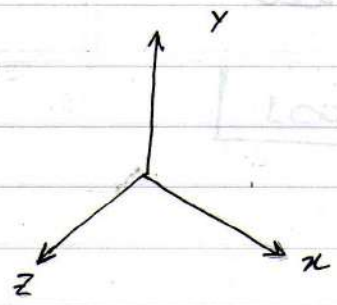
$\Rightarrow V$:





3





$L = 0,5\ m$

$\varnothing = 60\ mm$

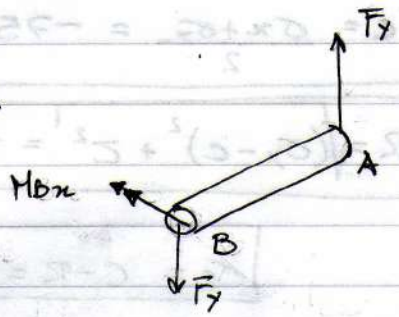
$F_x = 800\ N$

$F_z = 1\ kN$

$S_y = 190\ MPa$

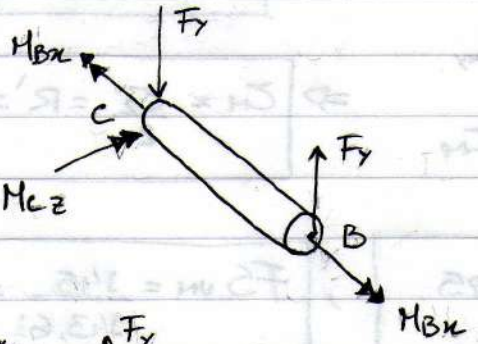
$T = 1\ kNm$

a) DCL BA



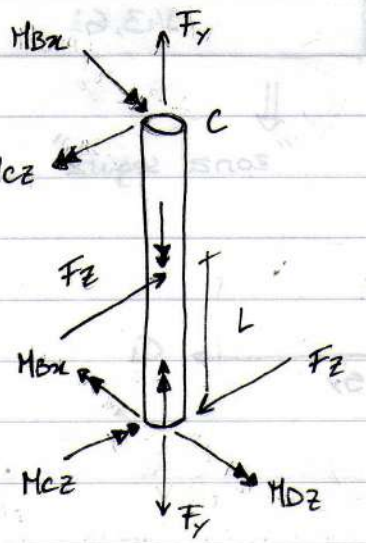
$M_{Bx} = 400\ Nm$

DCL CD

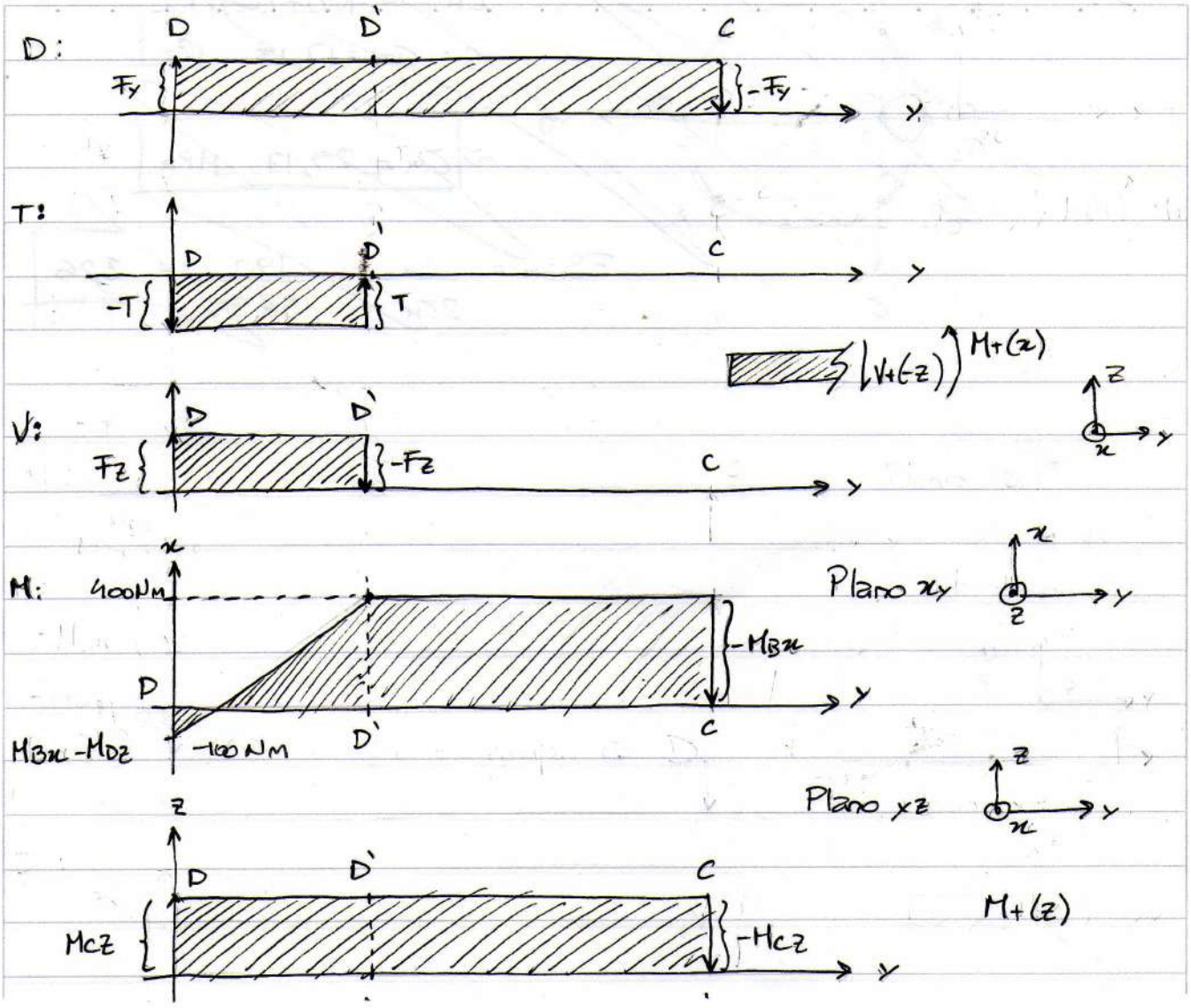


$M_{cz} = 600\ Nm$

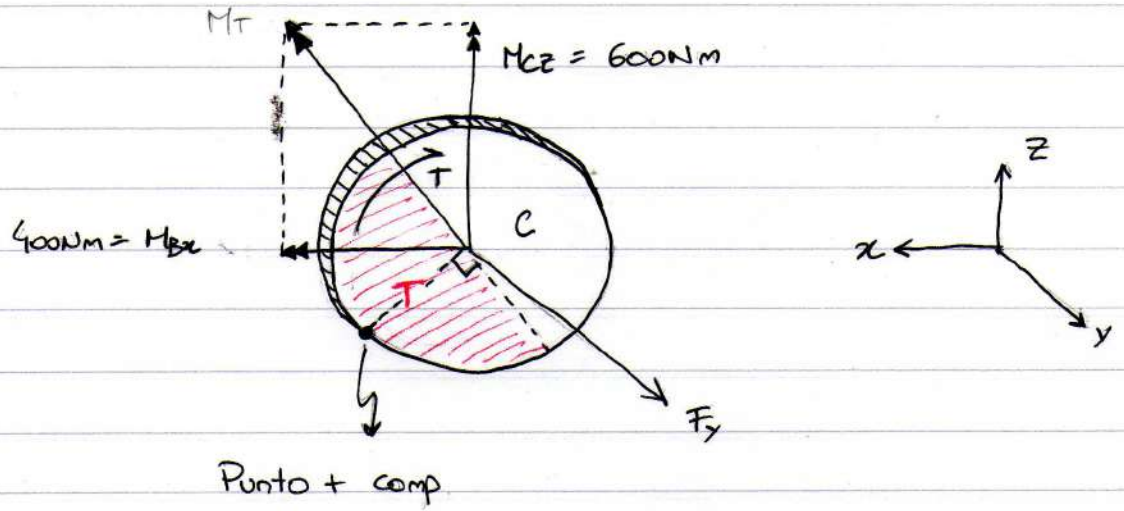
DCL CD



$M_{Dz} = 500\ Nm$


D:
D
D'
C
F_y
$-F_y$
y
T:
D
D'
C
y
-T
T
$M_+(z)$
$V_+(z)$
z
y
x
V:
D
D'
F_z
$-F_z$
C
y
M:
x
400 Nm
D
$-M_{Bx}$
y
$M_{Bx}-M_{Dz}$
-100 Nm
D'
C
Plano xy
x
y
z
z
Plano xz
y
x
z
D
D'
C
M_{cz}
$-M_{cz}$
y
$M_+(z)$

⇒ Sección + comp. es D', coinciden mayor flector y torsor

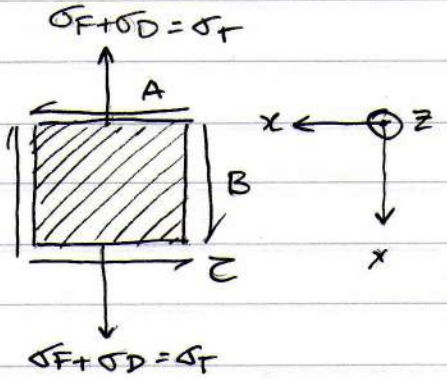


Punto + comp

$M_T = \sqrt{600^2 + 400^2} = \underline{721,11\ Nm}$,

$I = \frac{\pi \cdot R^4}{4} = 6,36 \times 10^{-7}$

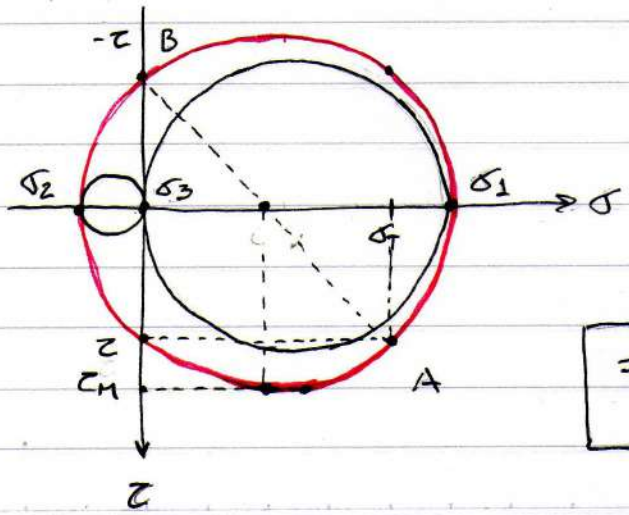
$J = \frac{\pi \cdot R^4}{2} = 1,27 \times 10^{-6}$



$\sigma_T = \frac{M_T \cdot C}{I} + \frac{F_x}{A}$

$\sigma_T = 34,29$ MPa

$\tau = \frac{T \cdot r}{J} = 23,6$ MPa



$\tau_M = R = \sqrt{(\sigma_T - C)^2 + \tau^2}$

$C = \frac{\sigma_T}{2} = 17,15$ MPa

⇒ $\tau_M = 29,17$ MPa

$FS_{3k} = \frac{S_x}{2\tau_M} = \frac{170}{58,34} = 3,26$