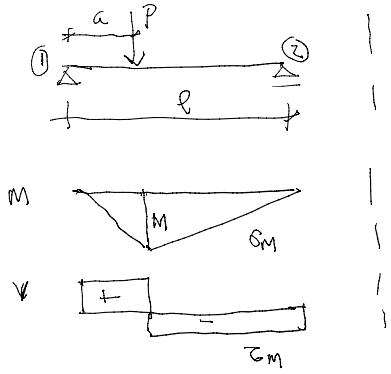
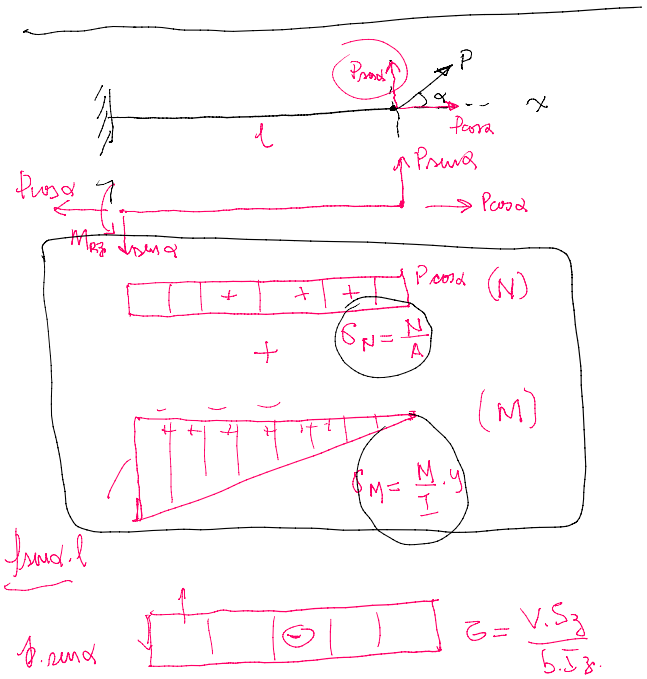
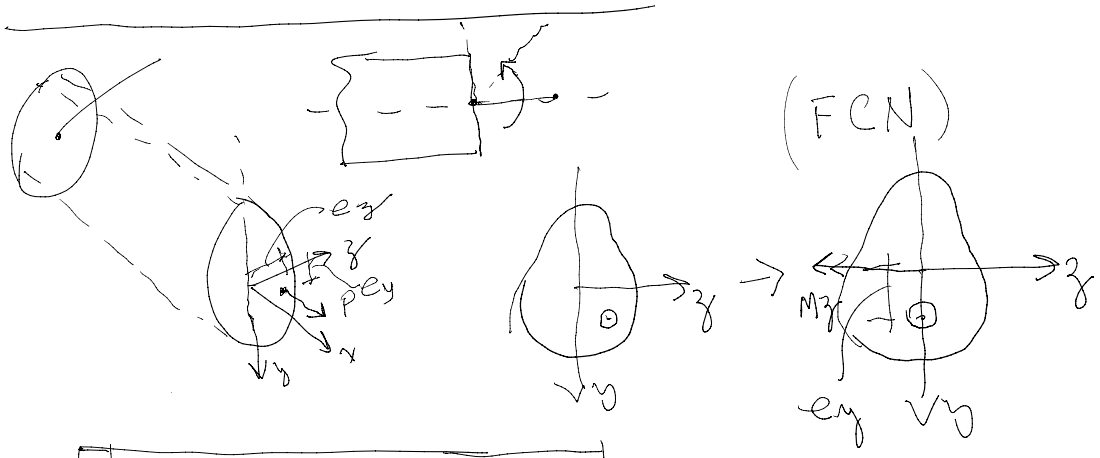
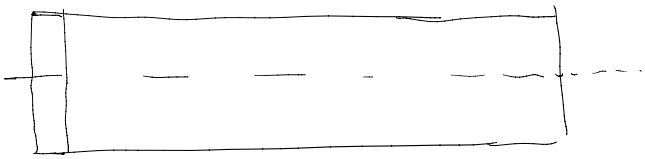
Flexão Composta Normal - conceitos e exemplos

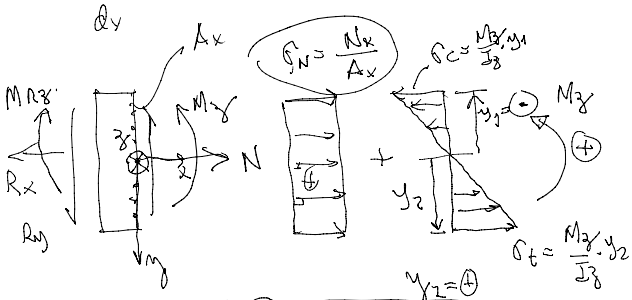
Tuesday, May 19, 2020 7:40 AM

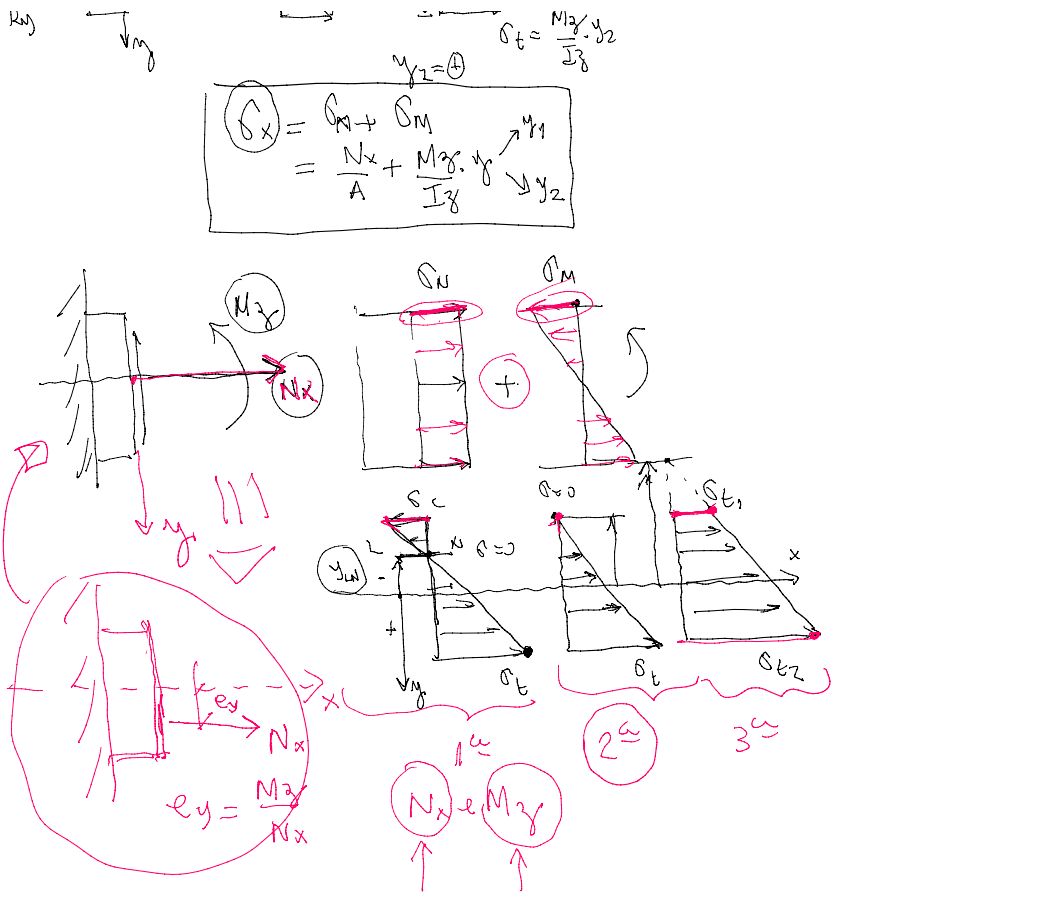


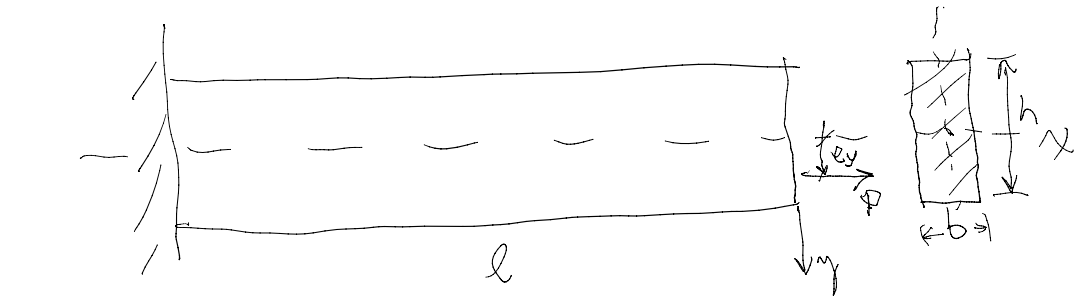


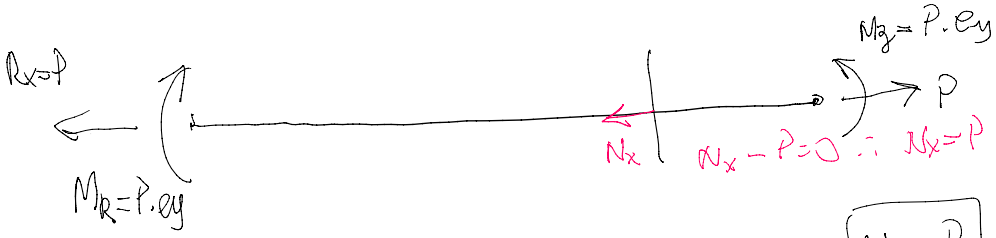


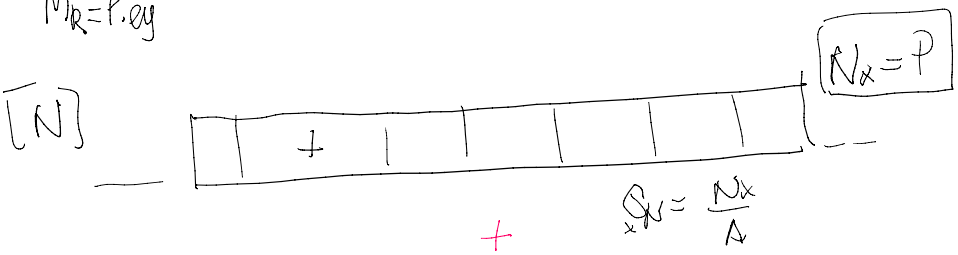












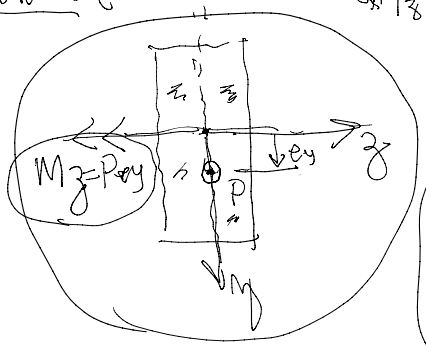
Flexão Composta normal // $\sigma_{x M_z} = \frac{M_z \cdot y}{I_z}$

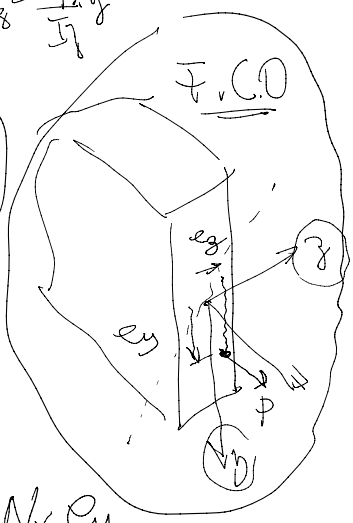
Flexão Composta normal

$\sigma_{xM_z} = \frac{M_z \cdot y}{I_z}$

$N_x = P$

$M_z = N_x \cdot e_y$

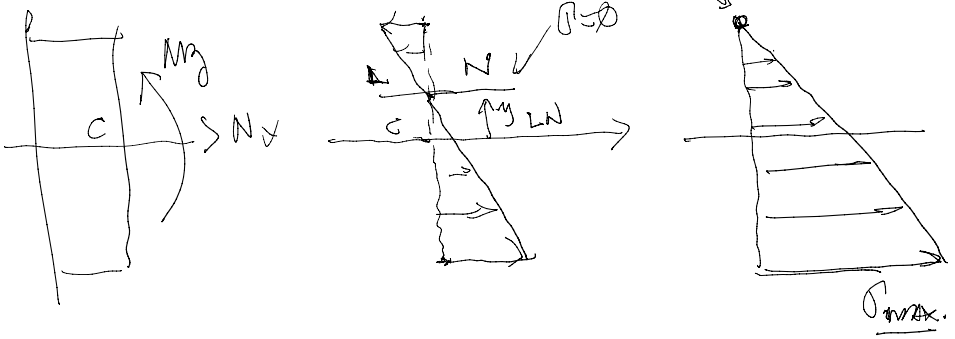


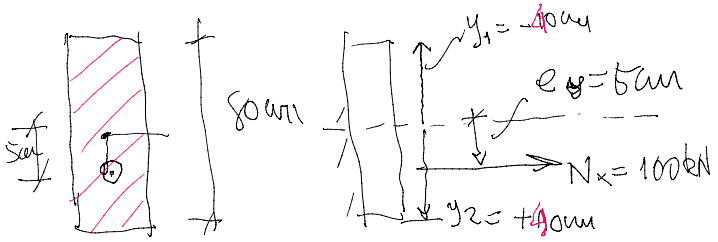


$\sigma_x = \sigma_{xN} + \sigma_{xM}$ $\quad M_z = N_x \cdot e_y$

$$\sigma_x = \frac{N_x}{A} + \frac{M_z \cdot y}{I_z} \equiv \sigma_x = \frac{N_x}{A} + \frac{N_x \cdot e_y \cdot y}{I_z}$$

$$\sigma_x = \frac{N_x}{A} + \frac{N_x \cdot e_y \cdot y}{I_z}$$

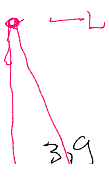




$$\sigma_x = \frac{N_x}{A_x} + \frac{N_x \cdot e_y \cdot y}{I_z}$$ $\quad y_1 = -40cm$ $\quad y_2 = +40cm$

$$\sigma_{x1} = \frac{+100kN}{1600cm^2} + \frac{100kN \cdot (5cm) \cdot (-40cm)}{\frac{b h^3}{12}} =$$

$$I_z = \frac{20 \times 80^3}{12} =$$



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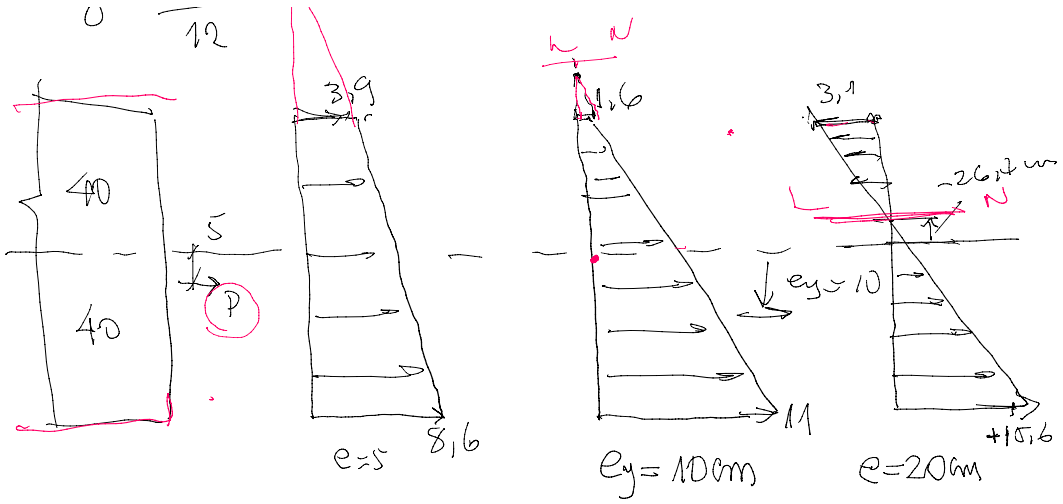
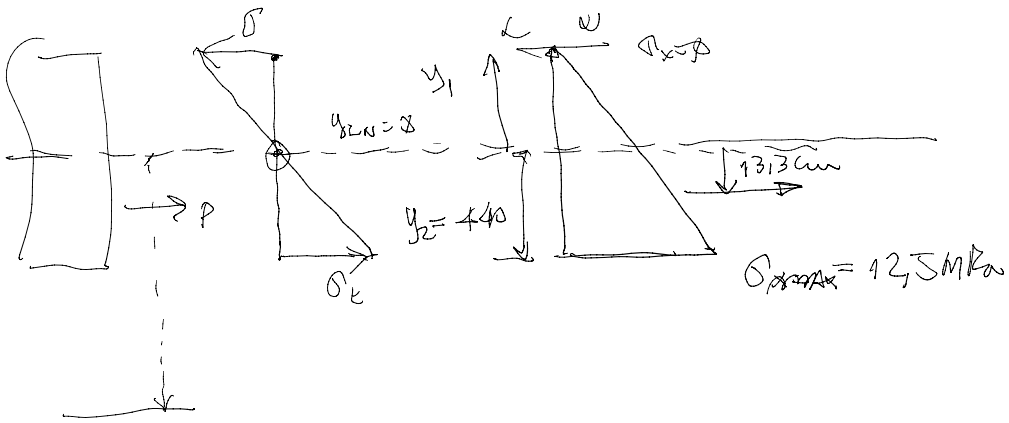


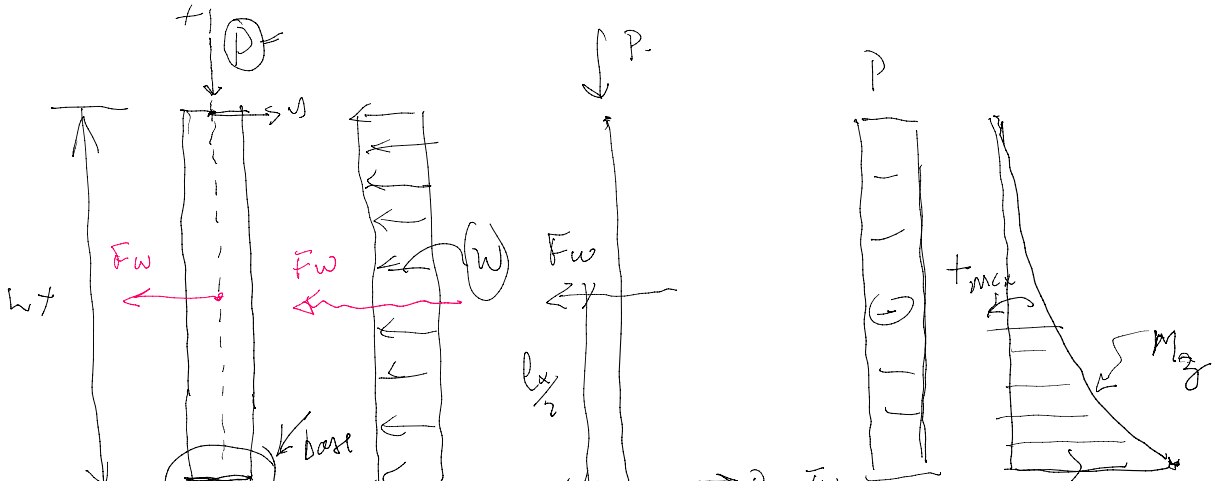
$$\sigma_x = \frac{N_x}{A_x} + \frac{(N_x \cdot e_y) \cdot y}{I_z}$$

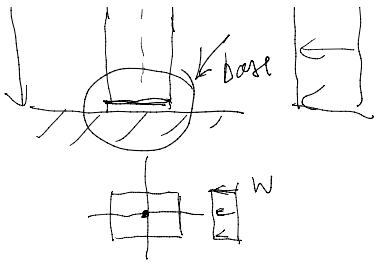
$$0 = -\left(\frac{N_x}{A_x}\right) + \frac{N_x e_y \cdot y_{LN}}{I_z}$$

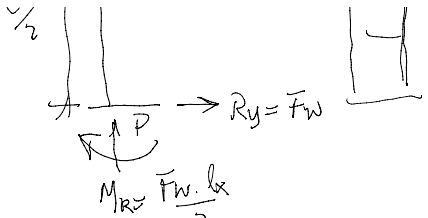
$$y_{LN} = -\frac{I_z}{A_x \cdot e_y} \quad (\sigma = 0)$$

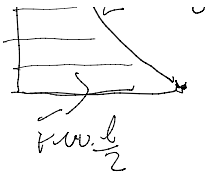
Com $y_{LN} = -10\,cm \Rightarrow e_y = -\frac{I_z}{A_x \cdot (y_{LN})} = 53{,}3$

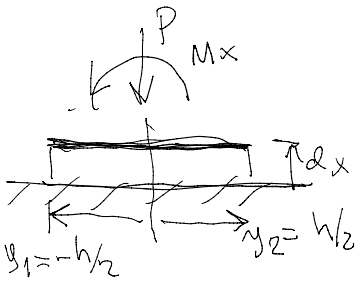












$$\sigma_x = \frac{N_x}{A_x} + \frac{M_z}{I_z} \cdot y \qquad y_1 = -h/2 \quad y_2 = h/2$$

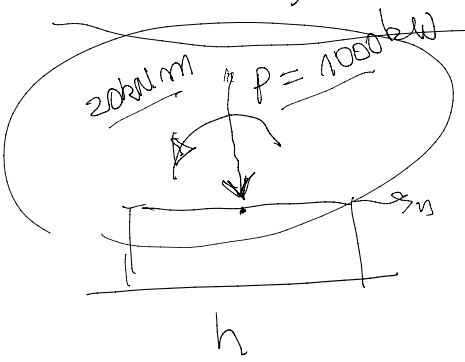
$$N_x = -P$$

$$M_z = \frac{F_w \cdot L_x}{2} \qquad F_w = w_y \cdot L_x$$

para $L_x = 10\,m$ e $w = 1\,\frac{kN}{m^2} \times 0{,}4\,m = 0{,}4\,\frac{kN}{m}$

$$F_w = 0{,}4\,\frac{kN}{m} \times 10\,m = 4\,kN$$

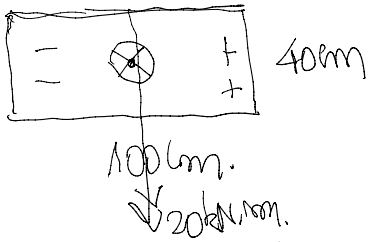
$$M_z = \frac{4\,kN \cdot 10\,m}{2} = 20\,kNm$$

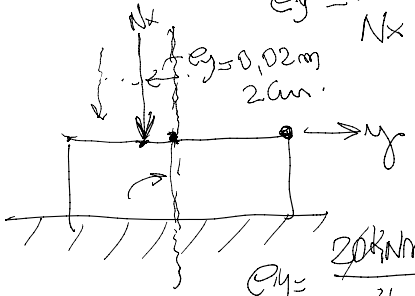


$$\sigma_x = \frac{N_x}{A_x} + \frac{M_z}{I_z} \cdot y \qquad y_1 = -50\,cm \quad y_2 = +50\,cm$$

$$\sigma_x = \frac{N_x}{A_x} + \frac{N_x \cdot e_y}{I_z}\, y$$

$$e_y = \frac{M_z}{N_x}$$



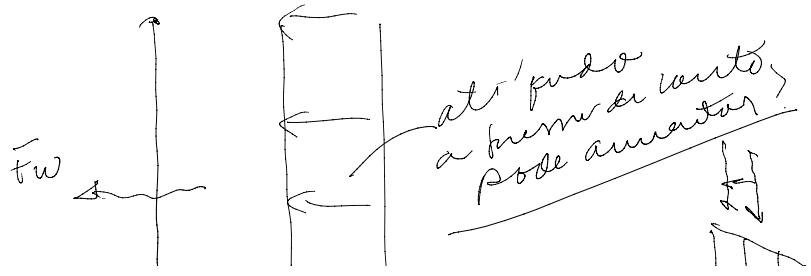


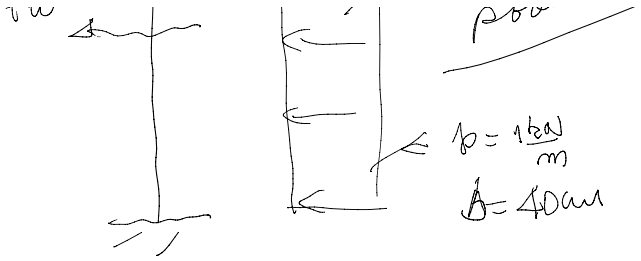
$$e_y = \frac{20\,kNm}{-1000\,kN}$$

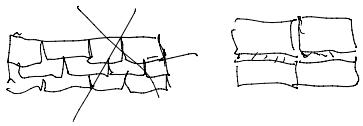
$$e_y = -0{,}02\,m$$

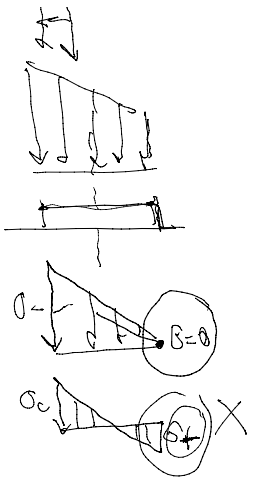
$$\sigma_x = \frac{N_x}{A_x} + \frac{N_x \cdot e_y}{I_{zc}}\, y$$

$$e_y = \frac{M}{N}$$







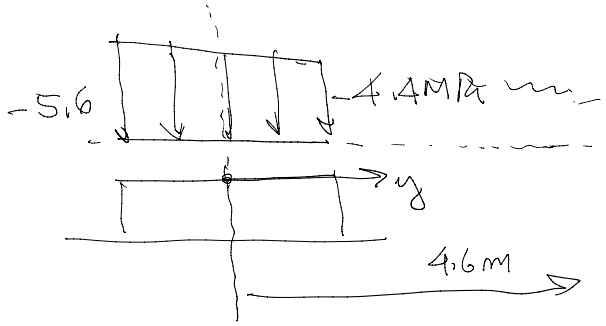


Calculo das tensões em y_1 e y_2

$$\sigma_{x1} = \frac{N_x}{A_x} + \frac{N_x \cdot e_y}{I_y} \cdot y_1$$

$\sigma_{x1} = -5,6\ MPa$

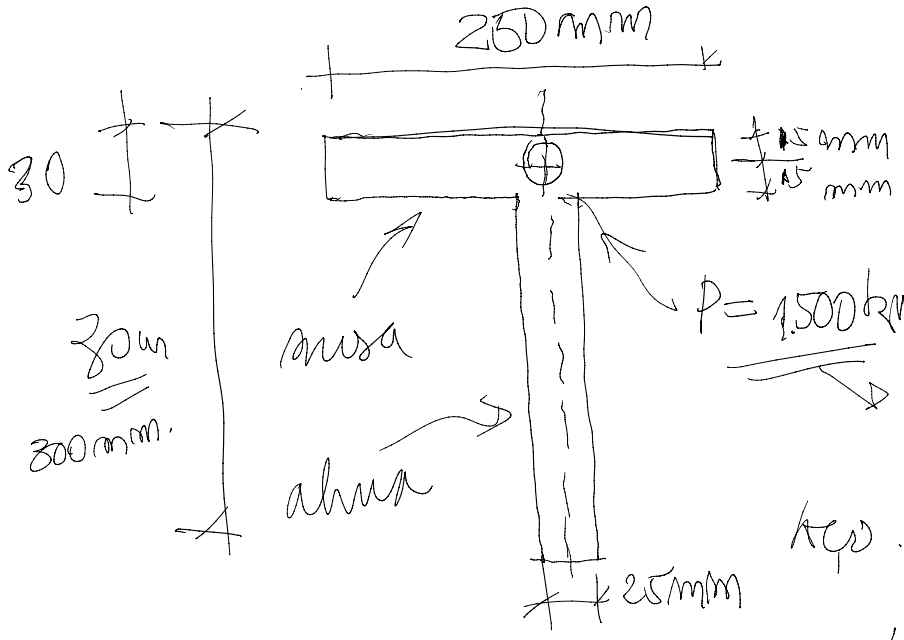
$\sigma_{x2} = -4,4\ MPa$



Ex. aplicação

Entrega: 5ª às 7h30

e disciplina



aço → 350 MPa → f_y

Calcula a y_{LN} e $\sigma_{1\,mm}$ $\sigma_{2\,max}$

Calculo o coef. de f_y $\gamma = ??$

$\sigma_{at} \leq \sigma_y / \gamma$