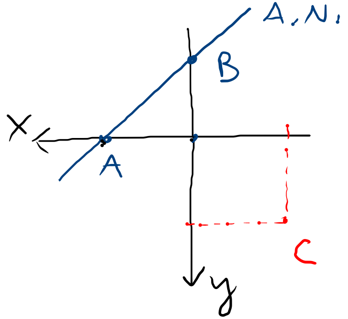
... TENSO FLESSIONE

SDC 13/12/23

$$0 = 1 + \frac{y_c}{\rho_x^2}\, y + \frac{x_c}{\rho_y^2}\, x$$

EQUAZ. A.N.



$A = (x_A, 0)$

$B = (0, y_B)$

x_A ? $\Rightarrow$ $1 + \frac{x_c}{\rho_y^2} x_A = 0$; $\boxed{x_A = -1 \cdot \frac{\rho_y^2}{x_c} = -\frac{\rho_y^2}{x_c}}$

INCOGNITA

NOTI

$$\frac{|x_A|}{\rho_y} = \frac{\rho_y}{|x_c|}$$

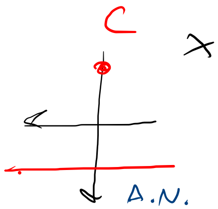
ρ_y è MEDIO PROPORZ. TRA $|x_A|$ e $|x_c|$

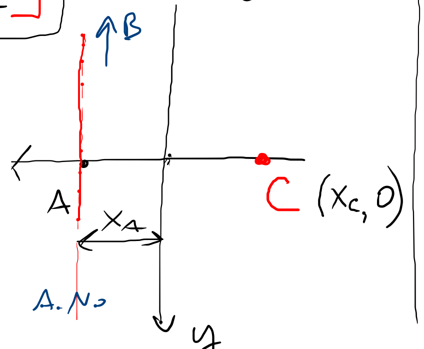
$\Downarrow$

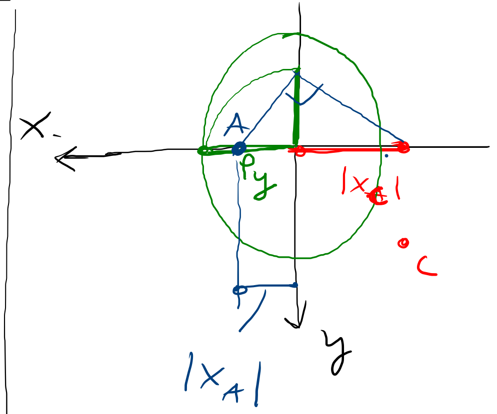
COSTRUZ. COL II TH. DI EUCLIDE

y_B ? $0 = 1 + \frac{y_c\, y_B}{\rho_x^2}$ $\Rightarrow$ $\boxed{y_B = -\frac{\rho_x^2}{y_c}}$ $\rightarrow$ $y_B \rightarrow \infty$ se $y_c \rightarrow 0$

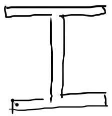
$$\rho_x = \sqrt{\frac{I_x}{A}} \; ; \; \rho_y = \sqrt{\frac{I_y}{A}}$$







SULL'UTILIZZO DELLA TEORIA DI S.V. PER OTTENERE TECNICA DELLA TRAVE.



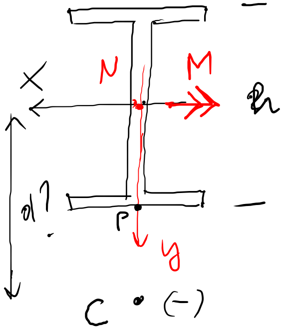
TRAVI CON "SEZIONI SOTTILI" : POSSO APPLICARE LA TEORIA DI S.V. A PATTO DI EVITARE LIVELLI DI SOLLECITAZIONE CHE POSSANO INDURRE FENOMENI DI "INSTABILITA' LOCALE"

ES IPE 200

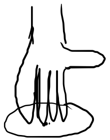
$I_x = 1943\ 0000\ mm^4$ $\quad N = -50\ KN$ (IN G)

$A = 2848\ mm^2$ $\quad M = 25\ KNm \Rightarrow M_x = -25\ KNm$

DATI



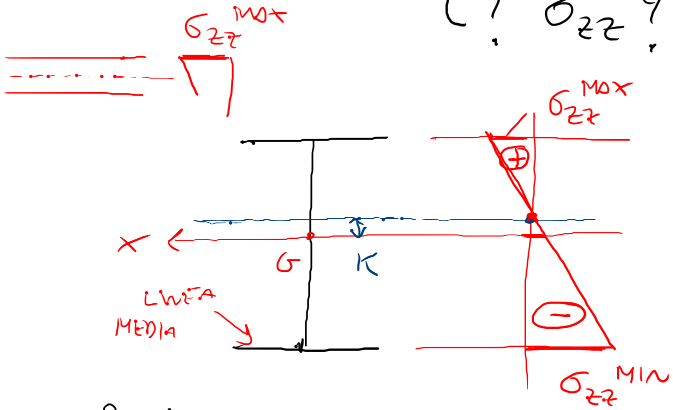
$P = (0, +100)$



$$d = \frac{M}{|N|} = \frac{25}{50} = 0{,}5\ m = 500\ mm$$

$$C = (0, +500)$$

INCOGNITE: C? σ_{zz}?



$$\sigma_{zz} = \frac{N}{A} + \frac{M_x}{I_x}\,y = -\frac{50\,000}{2848} + \frac{-25\,00\cancel{0}\ \cancel{000}}{1943\ \cancel{0000}}\,y$$

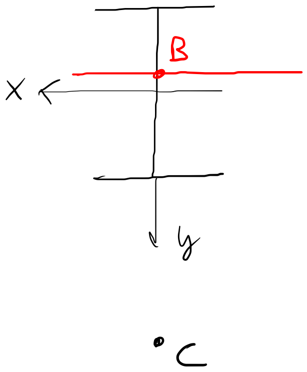
EQ ASSE NEUTRO: $\sigma_{zz} = 0$; $\boxed{y = -K}$

$$\sigma_{zz}(G) = -\frac{50000}{2848} < 0$$

$$\max\left\{\sigma_{zz}^{MAX},\ |\sigma_{zz}^{MIN}|\right\} \Rightarrow |\sigma_{zz}^{MIN}|$$

$$|\sigma_{zz}^{MIN}| = \left| -\frac{50000}{2848} - \frac{2500}{1943}\underbrace{(100)}_{y_P} \right| = 146\ N/mm^2$$

ALTRO MODO DI CALCOLARE LA POS. DELL' ASSE NEUTRO



$$1 + \frac{y_c}{\rho_x^2} y + \frac{x_c}{\rho_y^2} x = 0$$ GEN.

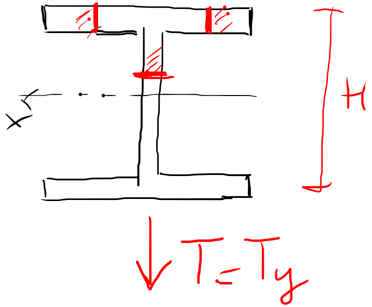
PER B $(0, y_B)$

$\Downarrow$

$$1 + \frac{y_c}{\rho_x^2} y_B = 0$$

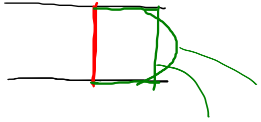
$$y_B = -\frac{\rho_x^2}{y_c} = -\frac{I_x}{A}\frac{1}{d} = -\frac{19430000}{2848}\frac{1}{500} = \underbrace{-13.6}_{K} \text{ mm}$$

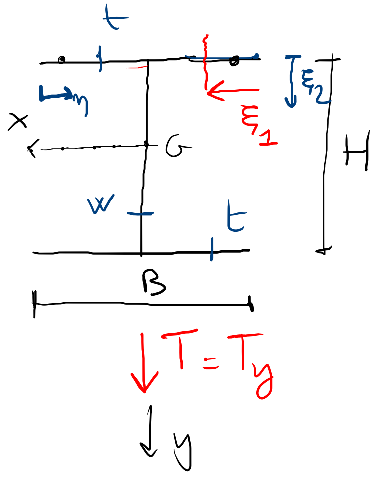
TENSIONI TANGENZIALI DEL PROBL. DI TAGLIO-FLESSIONE NELLE SEZ. SOTTILI



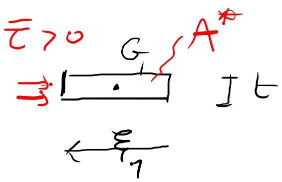
$$\bar{\tau}_{zs} = \frac{T_y}{I_x}\,\frac{S_x^*}{b}$$

LE $\bar{\tau}$ (MEDIE) COLGONO BENE IL TIPO DI SOLLECITAZIONE RELATIVO ALLE τ REALI.





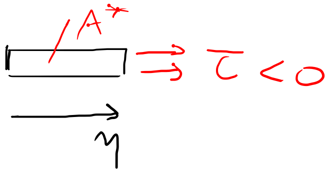
$$\xi_1 \in \left[0, \tfrac{B}{2}\right[\;;\quad \bar{\tau}_{zx}(\xi_1) = \frac{T}{I_x}\,\frac{1}{t}\underbrace{\left(t\,\xi_1\overbrace{\left(-\frac{H}{2}\right)}^{y_{G_1}}\right)}_{S_x^*(\xi_1)} = \frac{T}{I_x}\,\xi_1\left(-\frac{H}{2}\right) < 0$$

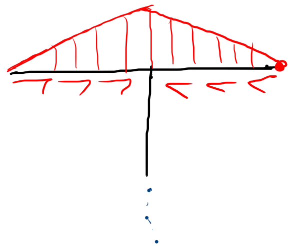


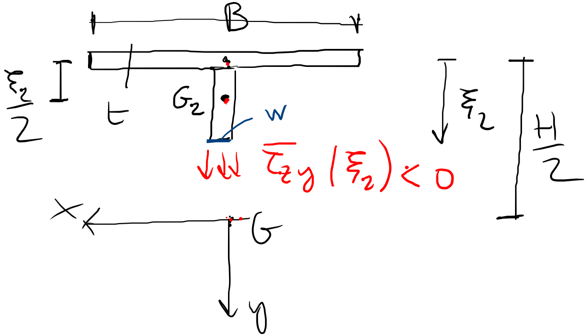
$\bar{\tau}_{zx}(\xi_1)$ ESCE DALLA SEZ. A^*

STUDIO L'ALTRA PARTE $\quad \eta \in \left[0, \tfrac{B}{2}\right[$

$$\bar{\tau}_{zx}(\eta) = \bar{\tau}_{zx}(\xi_1) \qquad (<0)$$

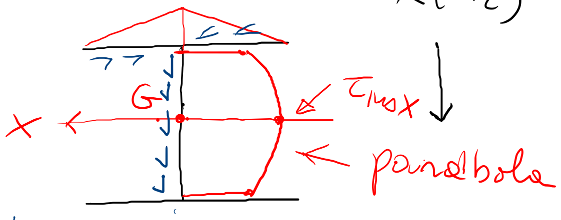


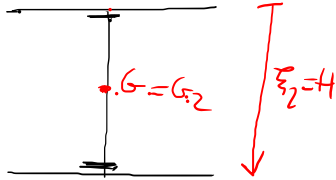




$$\tau_{zy}(\xi_2) = \frac{T}{I_x}\frac{1}{w}\Big(\underbrace{\underbrace{-Bt\frac{H}{2}}_{\text{ALA}} + \underbrace{\xi_2\, w\left(-\left(\frac{H}{2}-\frac{\xi_2}{2}\right)\right)}_{\text{RETT. VERTICALE}}}_{S_x^*(\xi_2)}\Big)$$: parabola $\ldots \xi_2^2$

< 0





QUAL È IL DOMINIO DI ξ_2? $]0, H[$

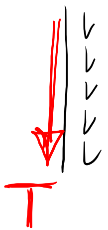
QUANTO VALE IL TERMINE $\left(\frac{H}{2} - \frac{\xi_2}{2}\right)$ quando

$\xi_2 \to H$: ESSO VALE 0

ALLORA $\tau_{zy}(0) = \frac{T}{I_x}\frac{1}{w}\left(-Bt\frac{H}{2}\right)$

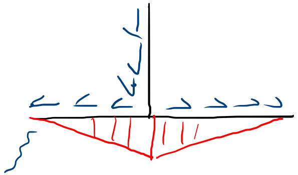
$= \tau_{zy}(H)$

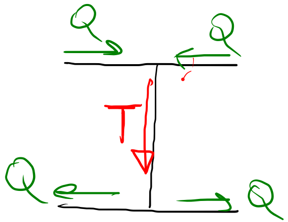
PER LA SEZ: $\int \tau_{zy}(\xi_2)\, dA = T$



$$\tau'_{zy}(\xi_2) = \text{COST}\left(\cancel{w}\left(-\left(\frac{H}{2}-\frac{\xi_2}{2}\right)\right) + \xi_2 \cancel{w}\,\frac{1}{2}\right) = 0$$

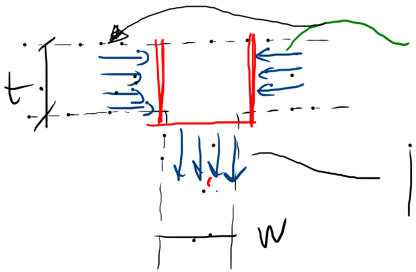
$$-\frac{H}{2} + \frac{\xi_2}{2} + \frac{\xi_2}{2} = 0 \implies \xi_2 = +\frac{H}{2}$$





STESSE τ DELLE ALI SUPERIORI MA CON SEGNO OPPOSTO.

STUDIO IL NODO IN ALTO



$$\left|\tau_{zx}\left(\frac{B}{2}\right)\right| = \left|\frac{T}{I_x}\,\frac{B}{2}\left(-\frac{H}{2}\right)\right| = \frac{T}{I_x}\,\frac{BH}{4}$$

$$\left|\tau_{zy}(0)\right| = \left|\frac{T}{I_x}\,\frac{1}{w}\left(-\frac{BtH}{2}\right)\right| = \frac{T}{I_x}\,\frac{1}{w}\,\frac{BtH}{2}$$

CALCOLO IL FLUSSO ENTRANTE NEL NODO : $\frac{T}{I_x}\,\frac{BH}{4}\,t \cdot 2 = \frac{T}{I_x}\,\frac{BHt}{2}$

($\tau \cdot$ spess.)

CALCOLO IL FLUSSO USCENTE DAL NODO : $\frac{T}{I_x}\,\frac{1}{w}\,\frac{BtH}{2} \cdot w = \frac{T}{I_x}\,\frac{BtH}{2}$

[IN OGNI NODO IL FLUSSO DELLE τ "ENTRANTE" COINCIDE CON IL FLUSSO "USCENTE".]

L'EQUIVALENZA DEI FLUSSI NON È APPLICABILE STRETTAMENTE ALLE INTENSITÀ DELLE τ