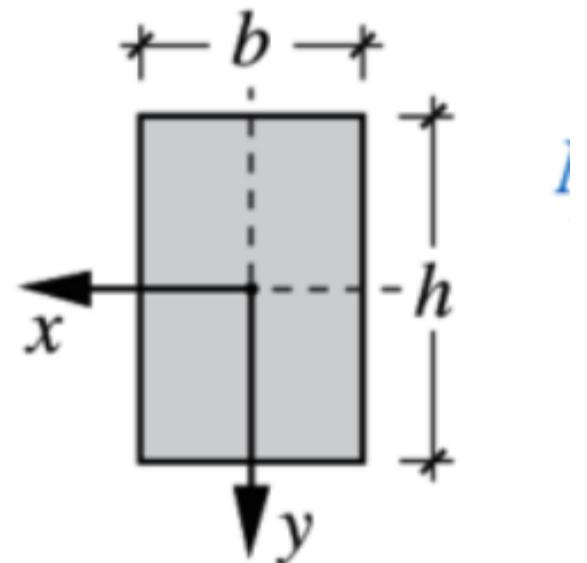
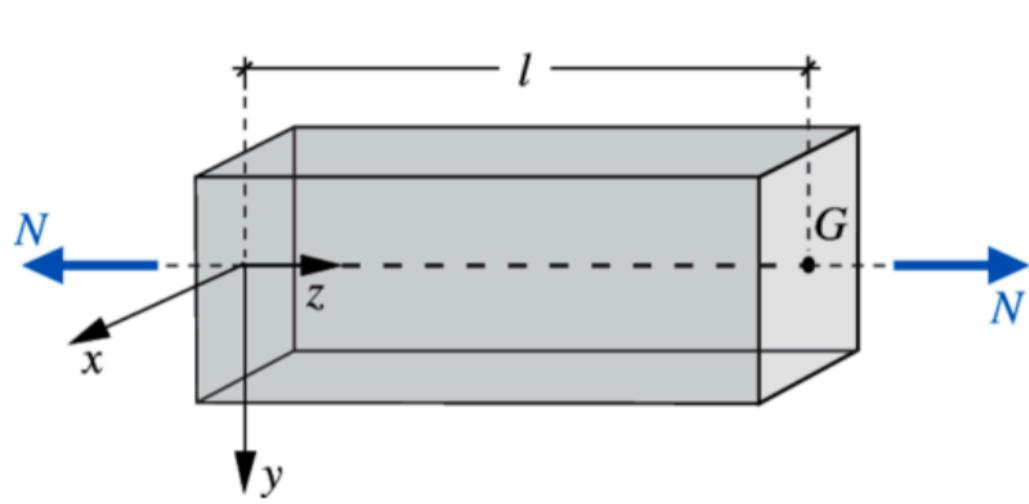
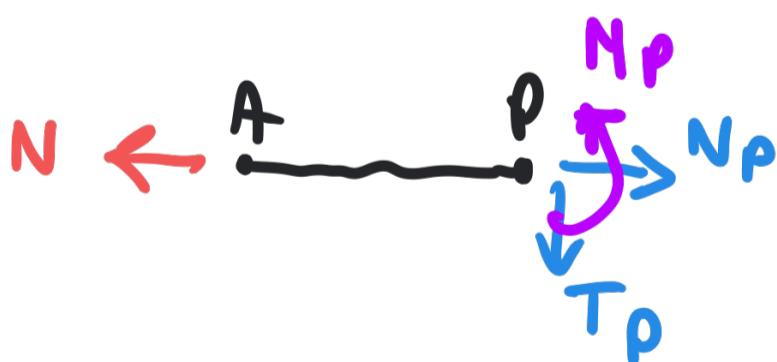
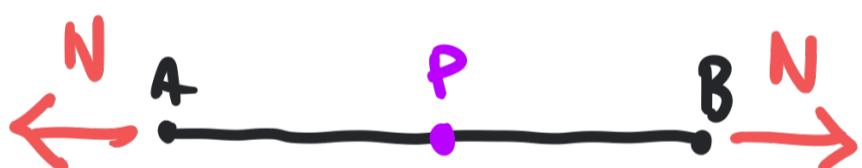


Stato tensionale in una trave tesa/compressa



Schema strutturale

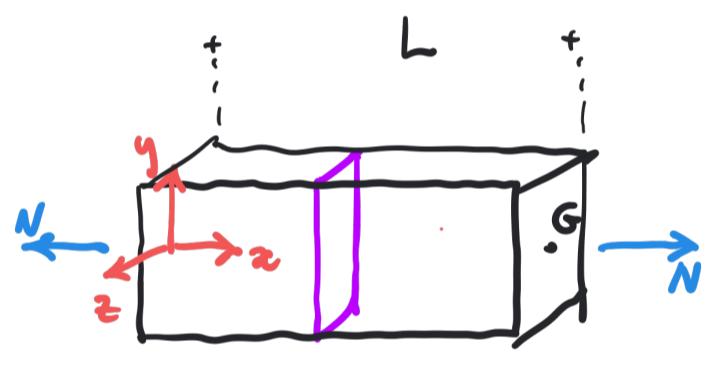


$$\sum F_x = 0 \Rightarrow N_p = N$$

$$\sum F_y = 0 \Rightarrow T_p = 0$$

$$\sum M = 0 \Rightarrow M_p = 0$$

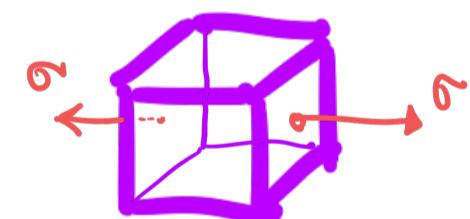
Stato tensionale in una trave tesa/compressa



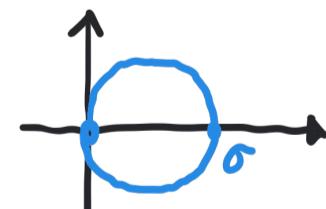
A cross-section of a rectangular beam with width b and height h . The area A is given by the formula $A = b \cdot h$.

Tensione

A diagram of a rectangular beam element under tension. A small cube is shown at the center, with normal stress σ indicated on one of its faces. The formula for stress is given as $\sigma = \frac{N}{A}$. The shear strain γ is labeled as zero.



Cerchio di Mohr (piani $z-x$ e $z-y$)



FLESSIONE UNIFORME → il momento flettente è costante.

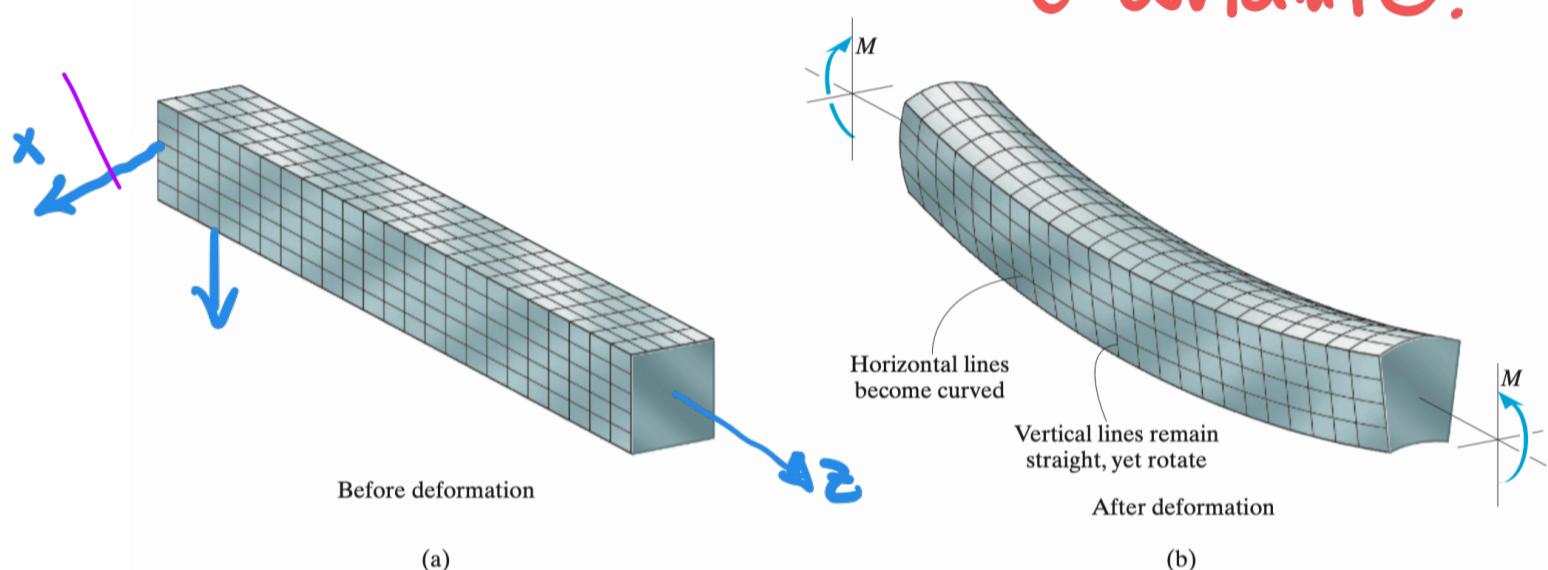
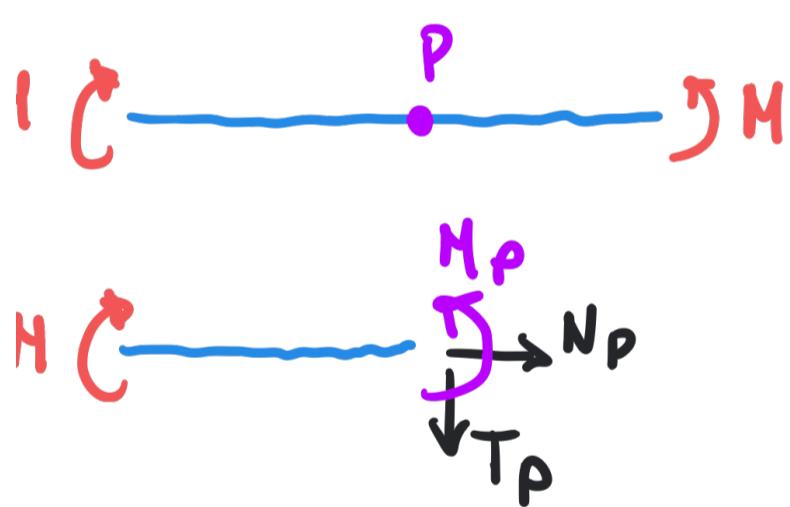
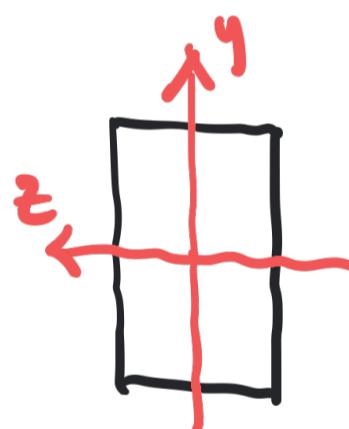


Fig. 6-19



$$M_p = M \text{ (costante)}$$

$$N_p = T_p = 0$$

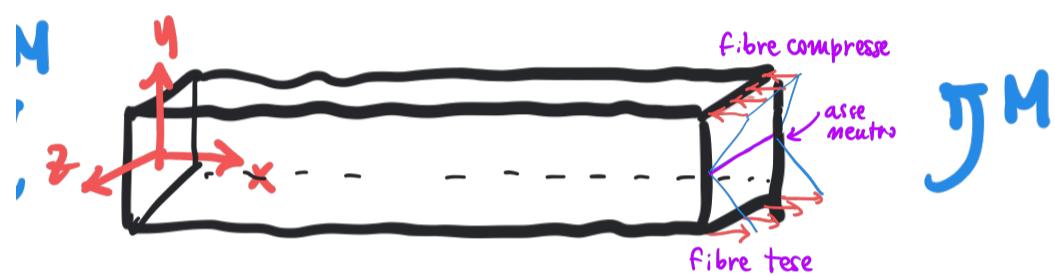


$$\sigma = -\frac{M}{I} y$$

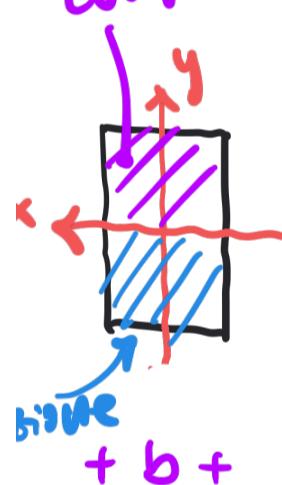
$$I = \int_A y^2 dA$$

Momento d'inerzia
rispetto all'asse z

Stato tensionale in una trave inflessa



compressione



$$\sigma = -\frac{M}{I} y$$

Sezione rettangolare

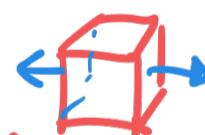
$$I = \frac{1}{12} b h^3$$

$$I = \int_A y^2 dA$$

$\sigma = 0$ per $y=0$ (asse neutro)

momento
d'inerzia rispetto
all'asse x .

- Lo stato tensionale è uniaxiale



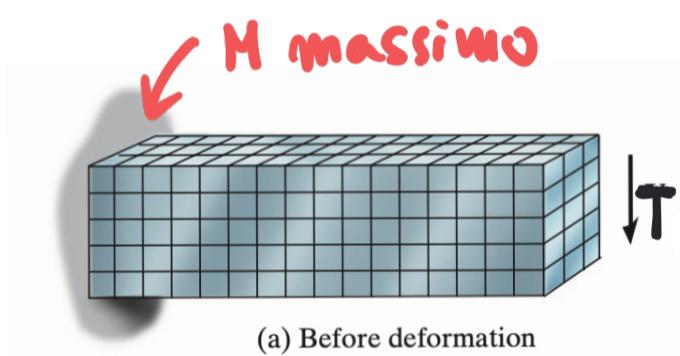
- I punti più sollecitati sono quelli più lontani dall'asse neutro.

Rif: Casini-Vasta pag. 18.10

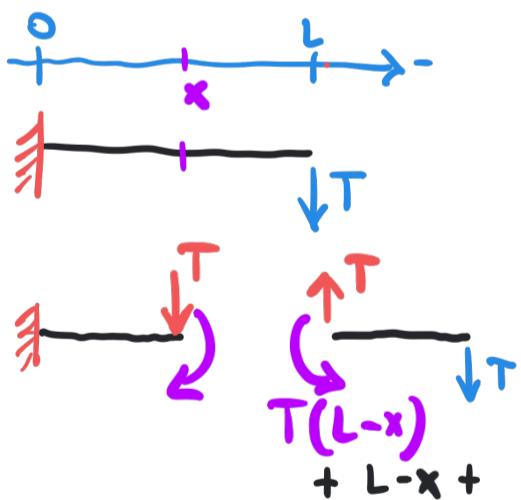
Hibbeler, pag. 10.7.

A differenza: Hibbeler orienta l'asse y verso l'alto, e dunque nella sua formula compare un segno -.

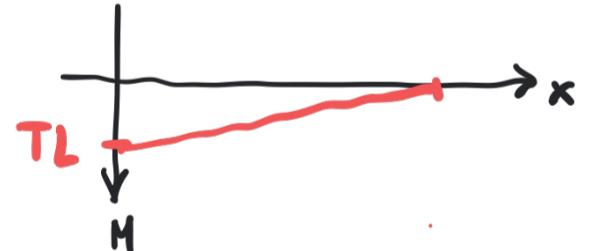
Flessione e taglio



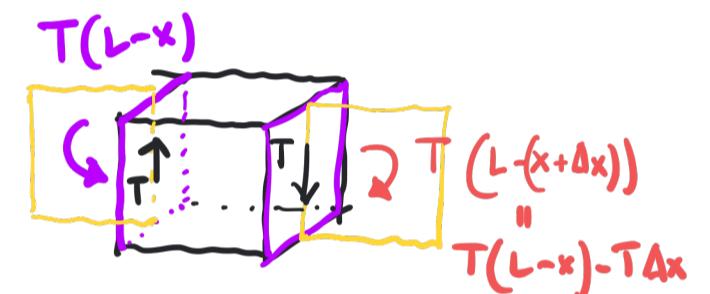
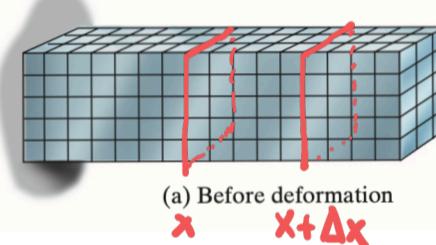
Schema strutturale



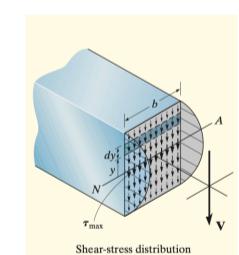
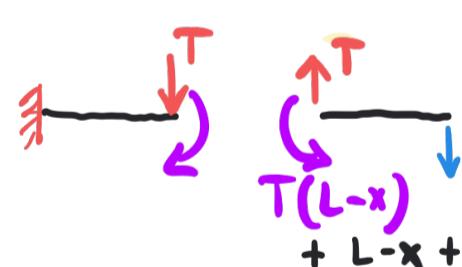
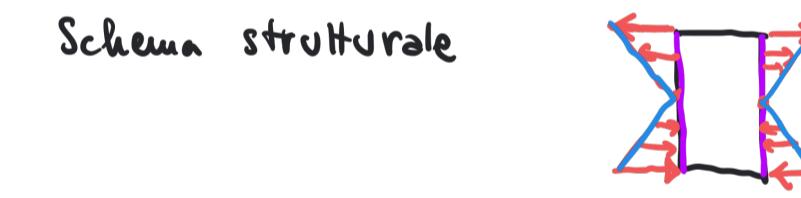
NB: una sollecitazione di taglio è sempre accompagnata da un momento flettente.



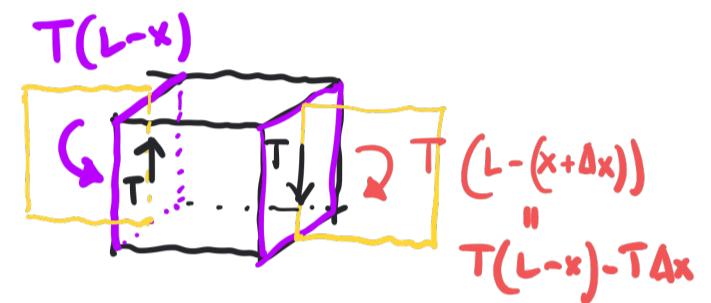
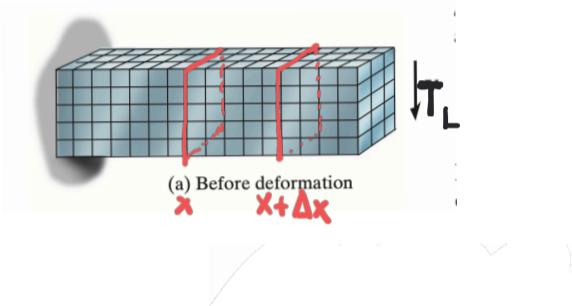
Flessione e taglio



Schema strutturale



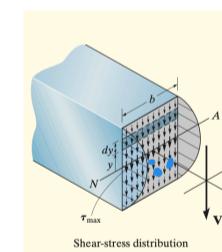
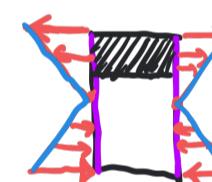
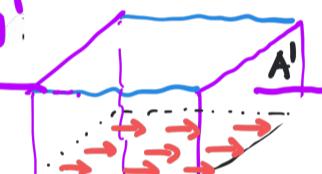
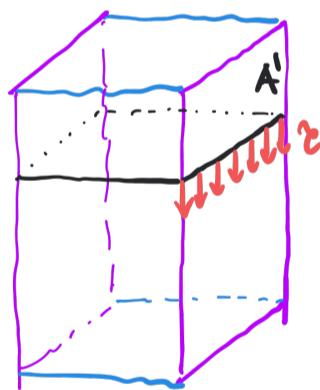
Flessione e taglio



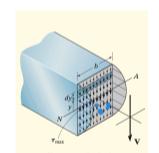
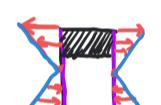
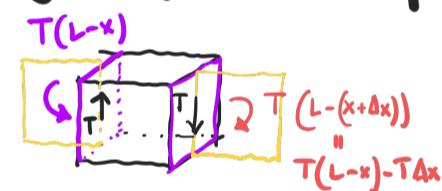
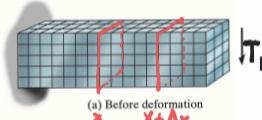
$$\int_{A'} \frac{T(L-x)}{I} y dA = \int \sigma dA = N'$$

$$N' = \int_{A'} \sigma dA = \int_{A'} \frac{T(L-x) - T\Delta x}{I} y dA$$

reciprocity



FORMULA DI JOURAWSKY



$$\int_{A'} \frac{T(L-x)}{I} y dA = \int \sigma dA = N' \quad N' = \int_{A'} \sigma dA = \int_{A'} \frac{T(L-x)-T\Delta x}{I} y dA$$

$$\rightarrow \sum F_x = 0$$

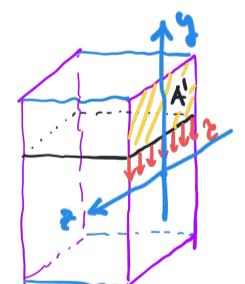
~~$$z b \Delta x - \frac{T}{I} (L-x) \int_{A'} y dA + \frac{T}{I} (L-x) \int_{A'} y dA - \frac{T}{I} \Delta x \int_{A'} y dA = 0$$~~

$$z = \frac{T}{bI} A' \bar{y}'$$

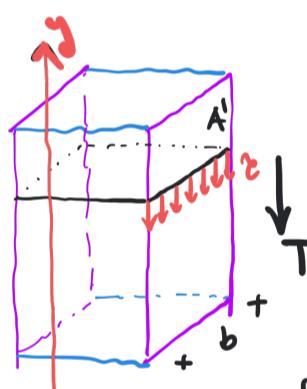
spessore della corda

area delle regioni sopra la corda

$$\int_{A'} y dA = \bar{y}' \text{ baricentro di } A'$$



FORMULA DI JOURANSY



$$z = \frac{T}{bI} A' \bar{y}'$$

area delle regioni
sopra la corda

$$\int_{A'} y dA = \bar{y}' \text{ baricentro di } A'$$

NOTEZ, ITALIANA

CASINI-VASTA (21.11)

$$z = - \frac{Tg}{S} \frac{S^x}{I_x}$$

$S^* = A' \bar{y}'$

HIBBELER
(11.3)

NOTAZIONE AMERICANA

$$z = \frac{VQ}{It} \quad Q = \bar{y}' A'$$

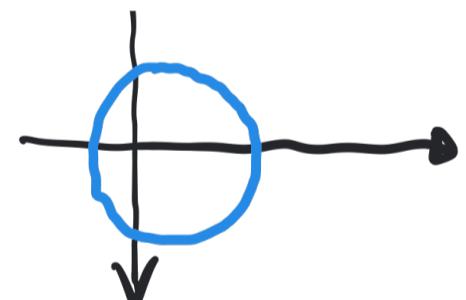
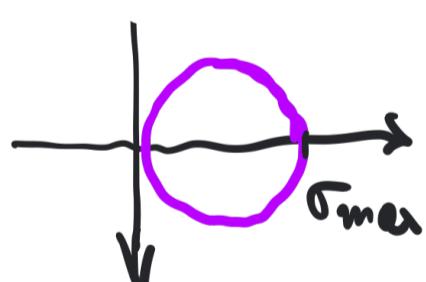
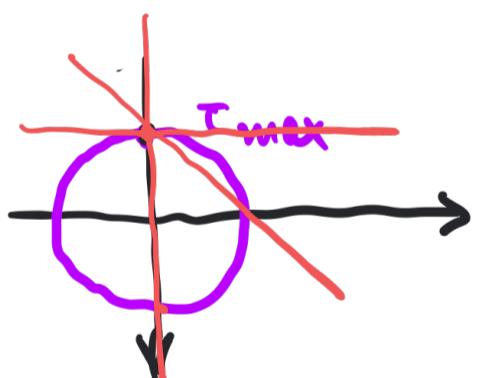
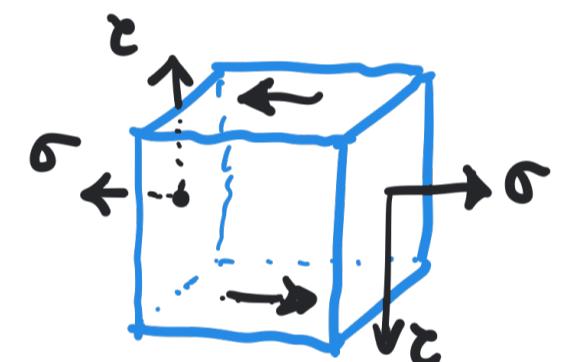
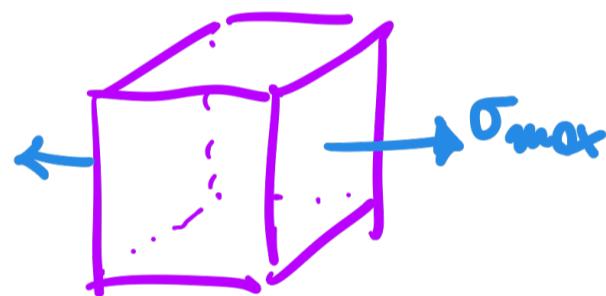
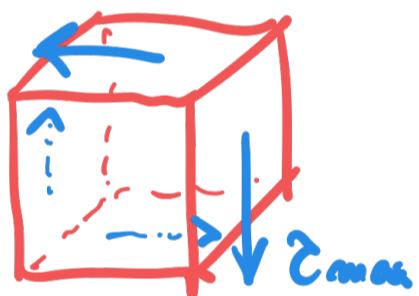
↑ spessore
corda

LA DISCEPANZA di segno è dovuta
al fatto che H. orienta l'asse y
verso l'alto

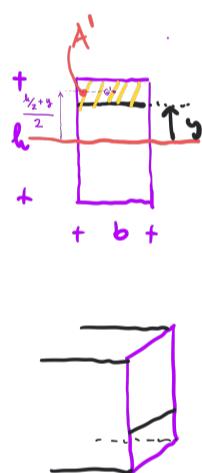
Stato tensionale



(a) Before deformation



TENSIONI TANGENZIALI NELLA SEZIONE RETTANGOLARE



$$z = \frac{T}{bI} A' \bar{y}'$$

area della regione sopra la corda

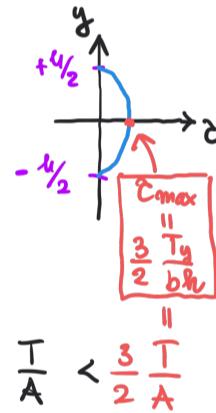
$$\int_A' y dA = \bar{y}' \text{ baricentro di } A'$$

$$A' = \left(\frac{h}{2} - y\right) b$$

$$\bar{y}' = \frac{1}{2} \left(\frac{h}{2} + y \right)$$

$$I = \frac{1}{42} b h^3$$

$$z = \frac{1}{2} \frac{T}{b \frac{1}{42} b h^3} \left(\frac{h}{2} + y \right) \left(\frac{h}{2} - y \right) b = \frac{6T}{bh^3} \left(\frac{h^2}{4} - y^2 \right)$$



$$\frac{T}{A} < \frac{3}{2} \frac{T}{A}$$

In una sezione rettangolare le tensioni tangenziali medie hanno andamento parabolico, e attingono il loro valore massimo in corrispondenza della corda media

Stimare C_{max} con la formula $C_{max} = T/A$ produce una sofferstima di C_{max} del 30%.