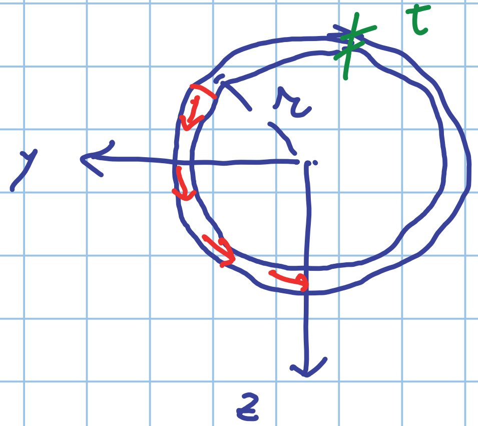
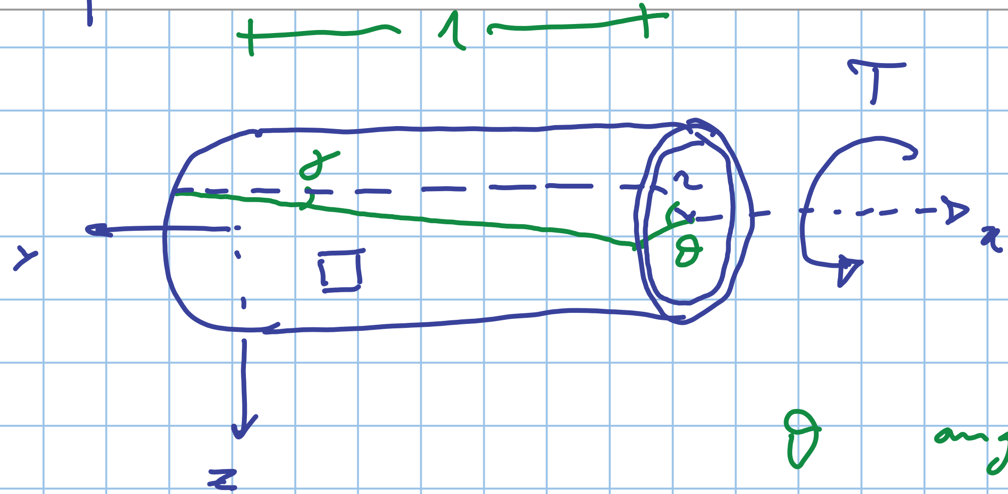
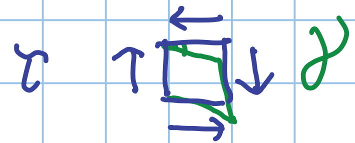
TORSIONE T





$$T = \int \tau \, r \, dA = \tau \cdot t \cdot 2\pi r$$

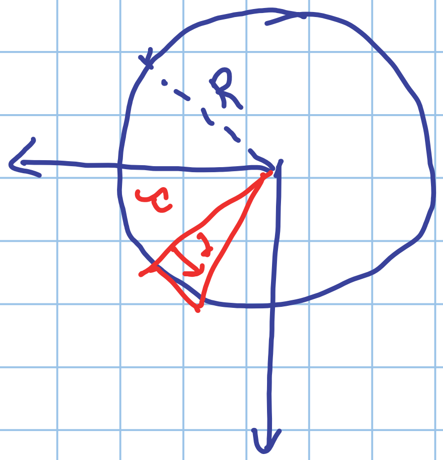
ϑ angolo unitario di rotazione

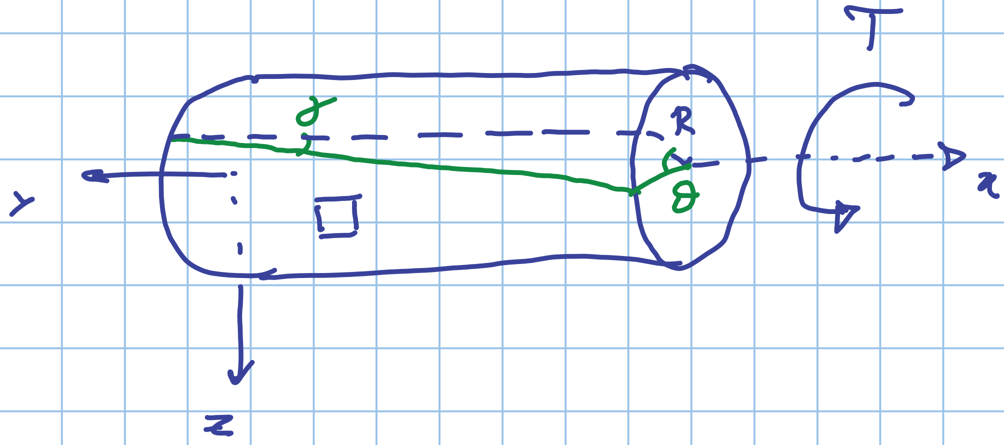


$$\gamma = \vartheta \, r \qquad \vartheta = \frac{\gamma}{r}$$

$$\tau = G \gamma$$

$$\tau = \frac{T \, r}{I_p}$$



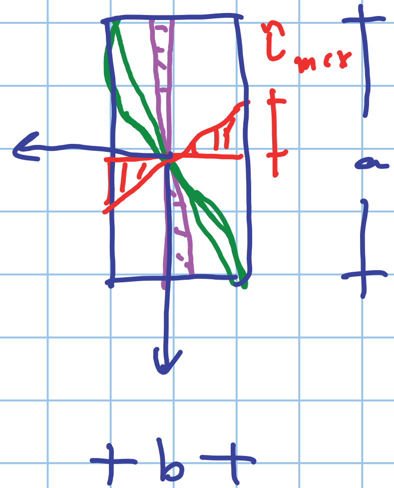


$$\tau = \frac{T}{I_p} r$$

varia linearmente in funzione della distanza

$$\tau_{max} = \frac{T}{I_p} R$$

$$\gamma = \frac{\tau}{G} = \frac{T}{G I_p} r$$



$$\tau_{max} = \psi \frac{T}{a\, b^2}$$

ψ dipende da $\frac{b}{a}$

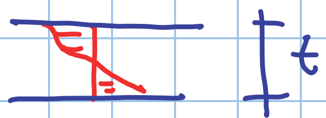
per $\frac{b}{a} \to 0$ $\quad \psi \to 3$

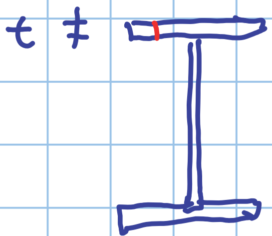
$$\tau_{max} = 3 \frac{T}{a\, b^2}$$

$a \geq b$

$$T = \tau \frac{a t^2}{3}$$

zoom





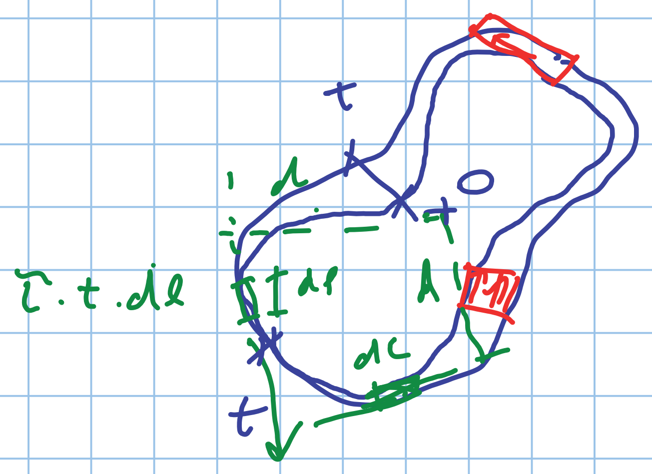
profili in acciaio aperti

$b \to t$ molto piccolo $\to$ il profilo non è in grado di portare una torsione elevata

SEZIONE CHIUSA

t variabile, ma sottile

$\tau \cdot t = \text{cost}$

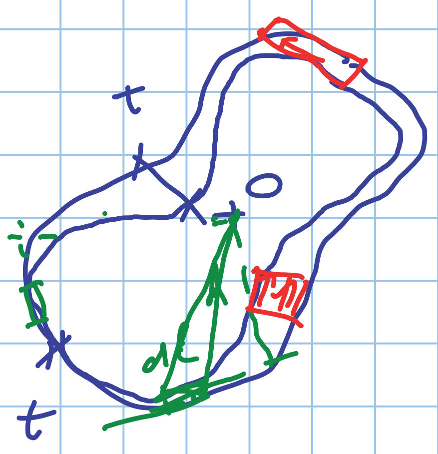


$$T = \int \underbrace{\tau\, d\, dA}_{\tau t\, dl\, d} \qquad \underbrace{dl\, d}_{2\, dA_{tr.}}$$

BREDT

$$= \tau t\, 2 \int dl\, d = \tau t\, 2 A_k$$

A_k area racchiusa da linea media



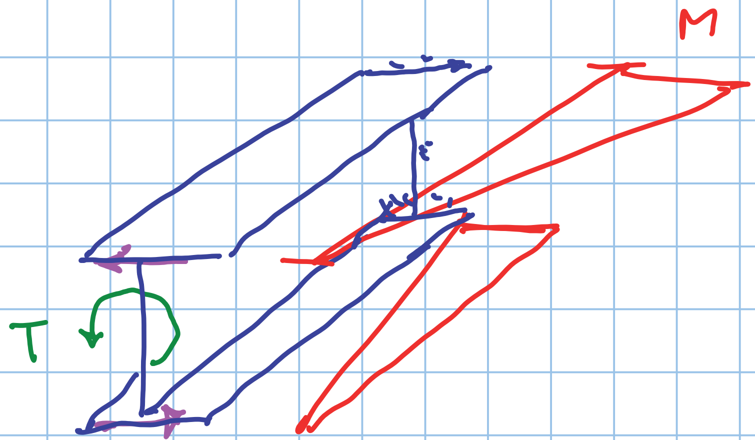
area triangolo $\dfrac{dl \cdot d}{2}$

$$\tau = \frac{T}{2\, t\, A_k}$$

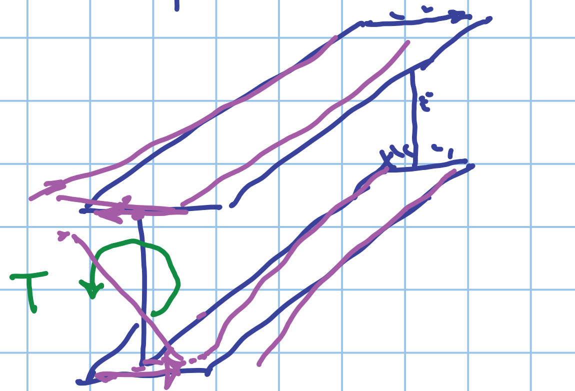
D.S.V. Torsione ⇐ primaria

torsione secondaria

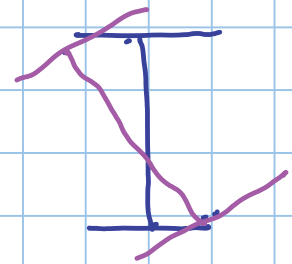
VLASOV



$F = \frac{T}{h}$



$F = \frac{T}{h}$



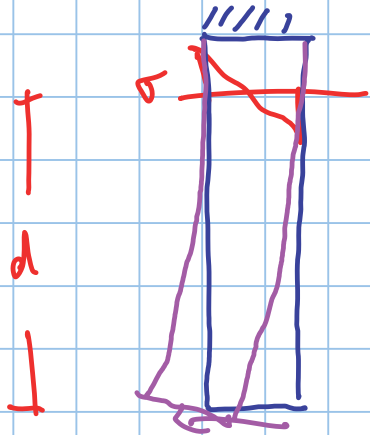
B bimomento

$B = M \cdot h$

ω = coordinata settoriale

$$\sigma = \frac{B}{I_\omega} \cdot \omega$$

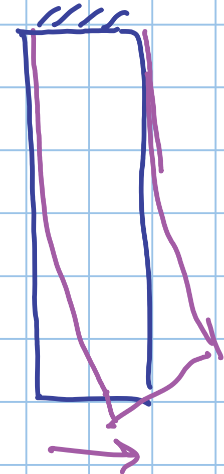
$$I_\omega = \int \omega^2 \, dA$$



$M = F \cdot d = \frac{T}{h} d$

massima σ

ALA SUP.

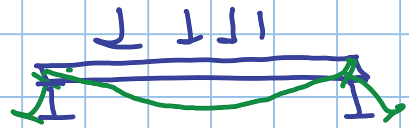


ALA INF.

Quando ho torsione uso profili chiusi

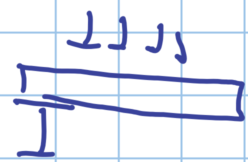
$$\tau = \frac{T}{2 t A_*} \qquad T_{Rd} = 2 t A_* \frac{f_y / \sqrt{3}}{\gamma_{M0}}$$

TORSIONE — per congruenza



SI TRASCURA

— per equilibrio



SI DEVE CONSIDERARE

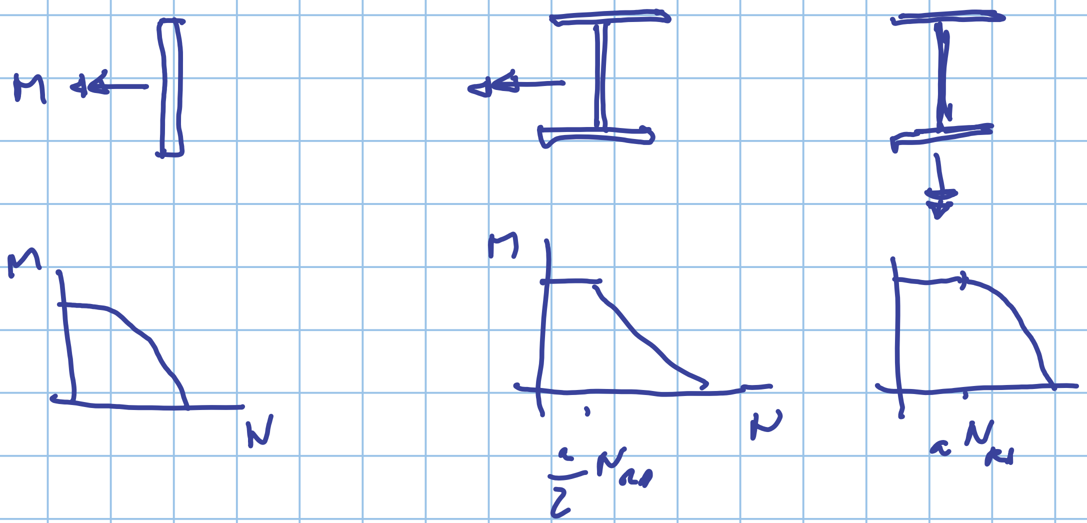
SINTESI TENSO-PRESSO FLESSIONE

TENSO

sezione generica — dato N_{Ed} — trovare asse neutro $N = (A_T - A_C)\frac{f_y}{\gamma_{M0}}$

calcolare $M_{Rd} = 2 S_{Ten.} \frac{f_y}{\gamma_{M0}}$

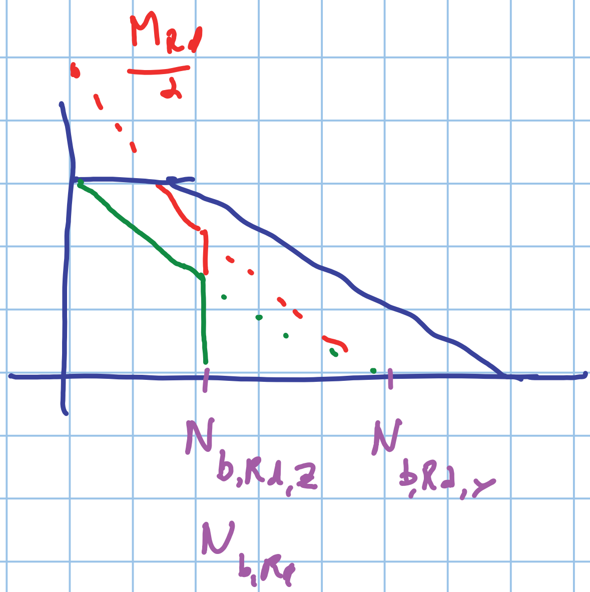
sezioni particolari

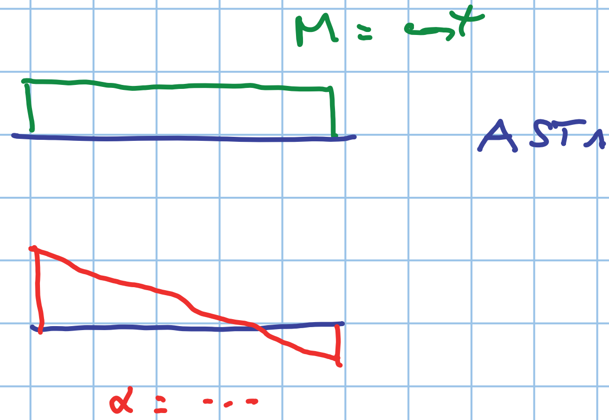


$a \leq 0.5$

PRESSO

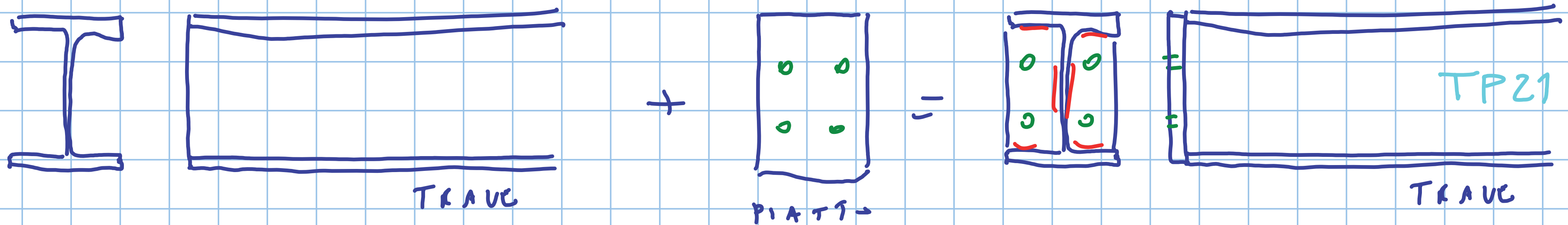
TENSO.

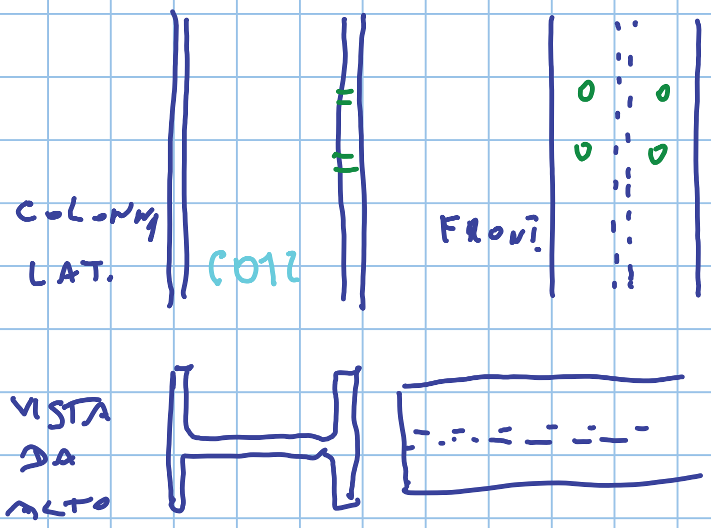




COLLEGAMENTI

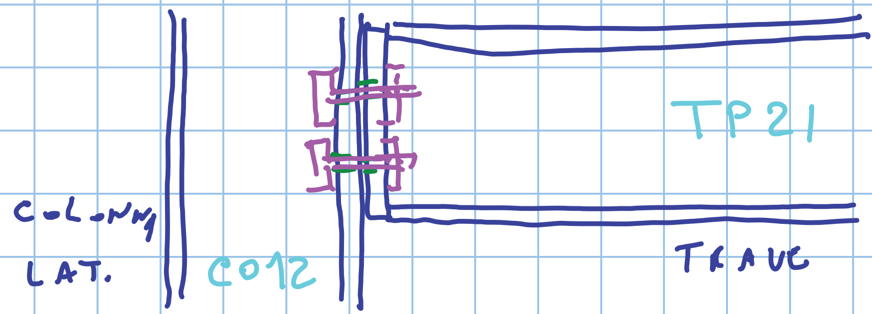
mediante BULLONI o SALDATURE

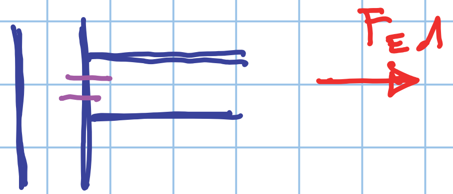




lavorazione in officina

4 M16 8.8

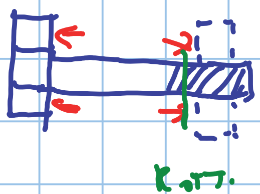


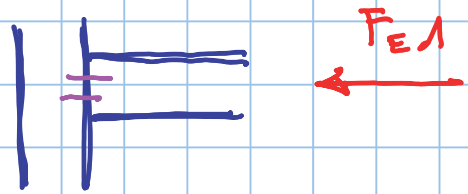


BULLONI

lavorano a TRAZIONE

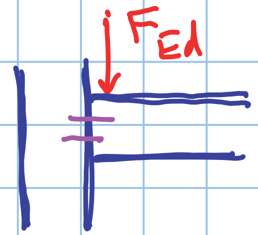
$$F_{t,Ed} = \frac{F_{Ed}}{4}$$





BULLONI

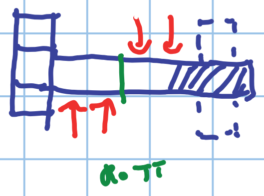
lavorano NO

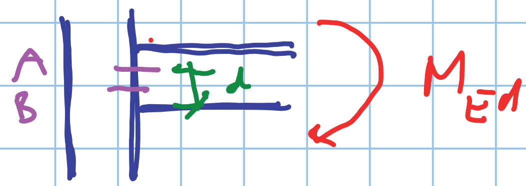


BULLONI

lavorano a taglio

$$F_{V,Ed} = \frac{F_{Ed}}{4}$$

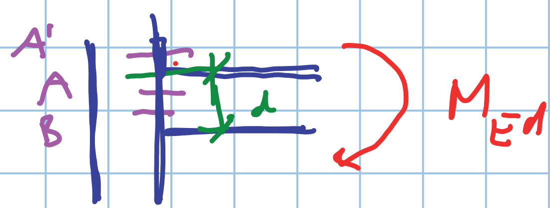




BULLONI

A lavorano a Trazione ; B non lavora

$$F_{t,Ed} = \frac{M_{Ed}}{2d}$$



A e A' ten.

$$F_{t,Ed} = \frac{M_{Ed}}{4d}$$