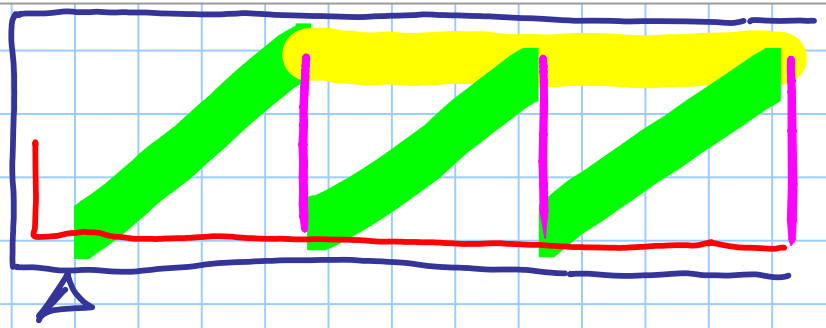
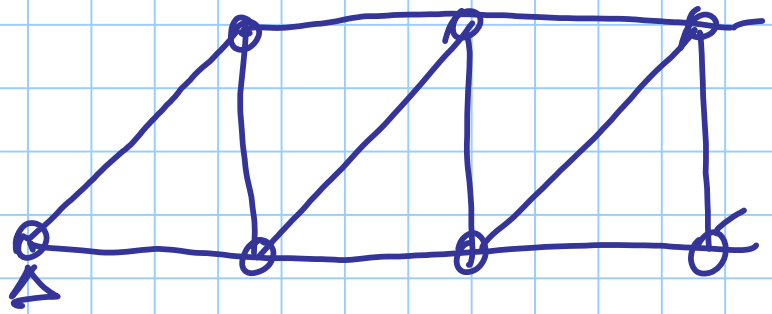
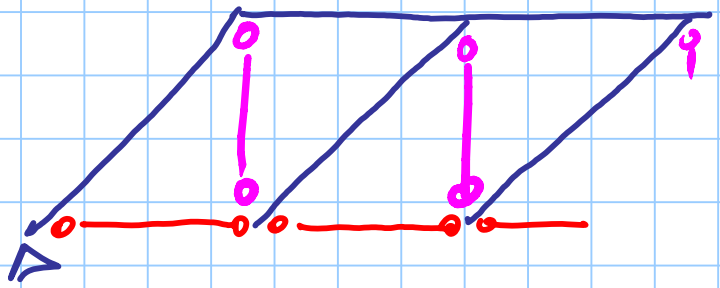
Titolo nota 13/05/2015

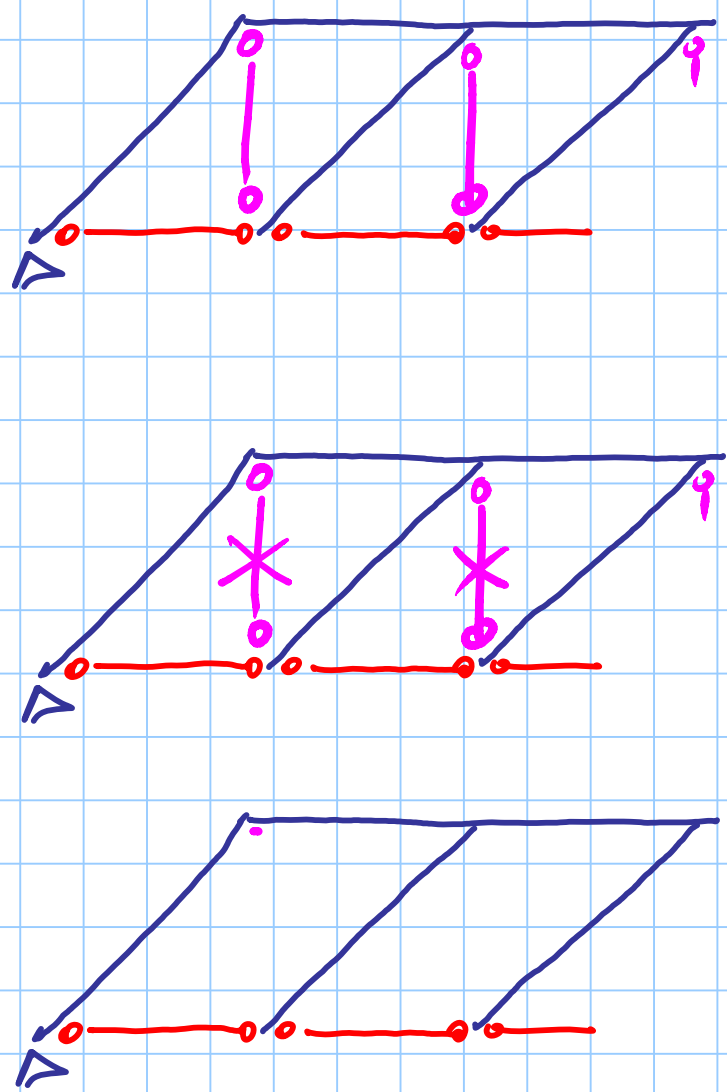






modello di
Traliccio di Mörsch

Traliccio iperstatico
in campo elastico non
cambia quasi niente



OLTRE IL LIMITE ELASTICO

- cls rott. ⇒ FINE
- staffe snervate ⇒ duttili

si può portare ulteriormente?

con staffe snervate

senza staffe cosa resta?

IL PETTINE

V_{wd} taglio che fa snervare le staffe

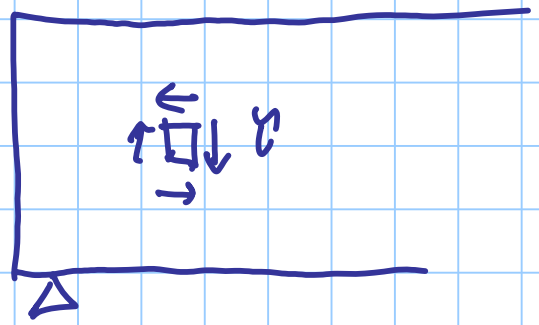
$V_{Rd,c}$ taglio che può portare il pettine

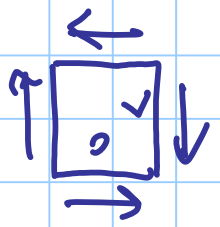
MODELLO "NORMALE"

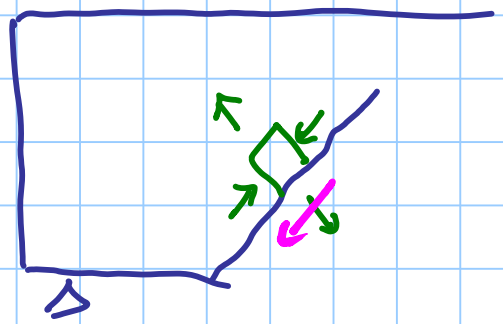
DM 1996

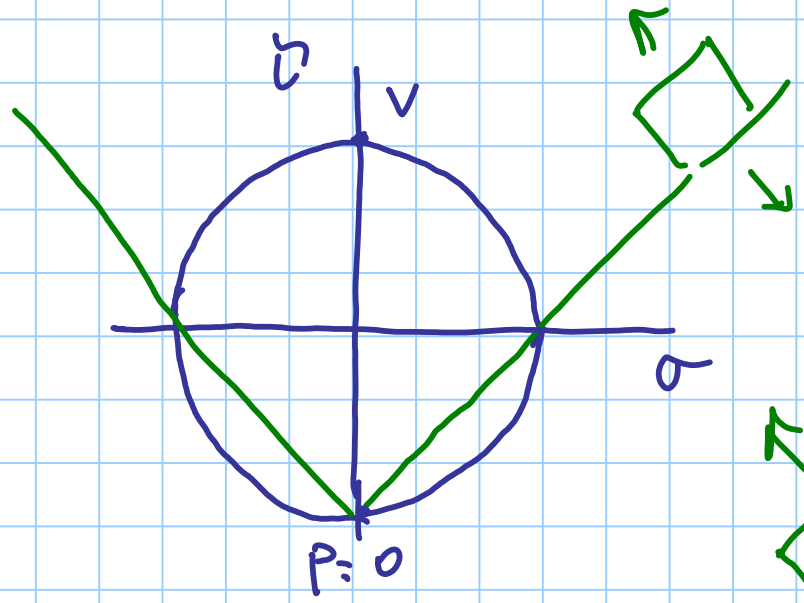
EC2 anni '90

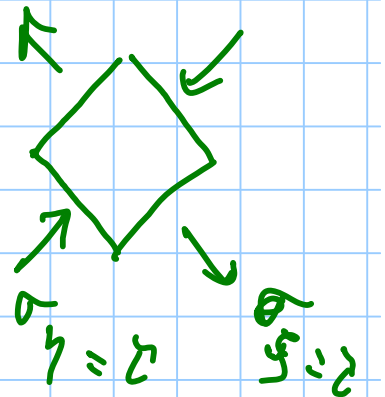
$$V_{Rd} = V_{wd} + V_{Rd,c}$$



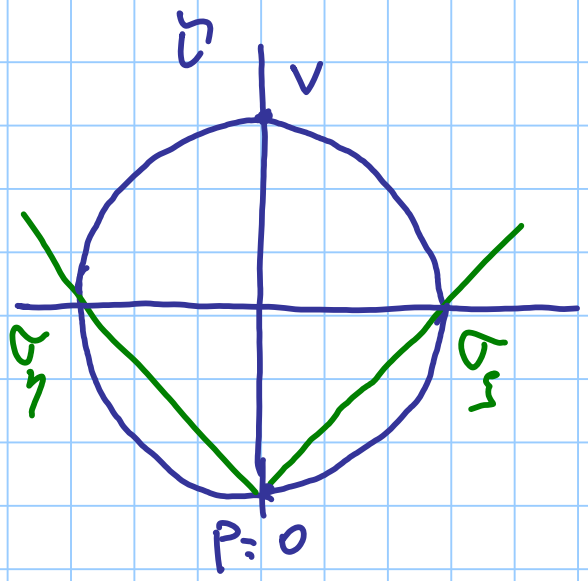


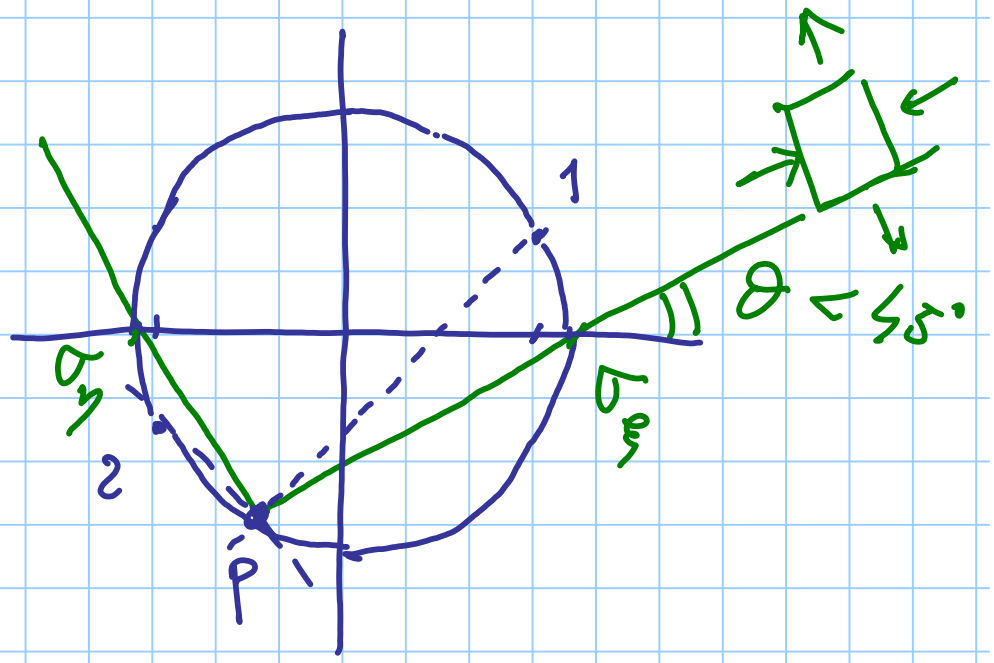


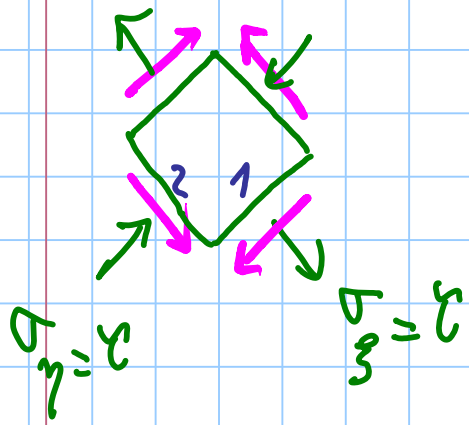




è dovuta all'ingranamento degli inneti

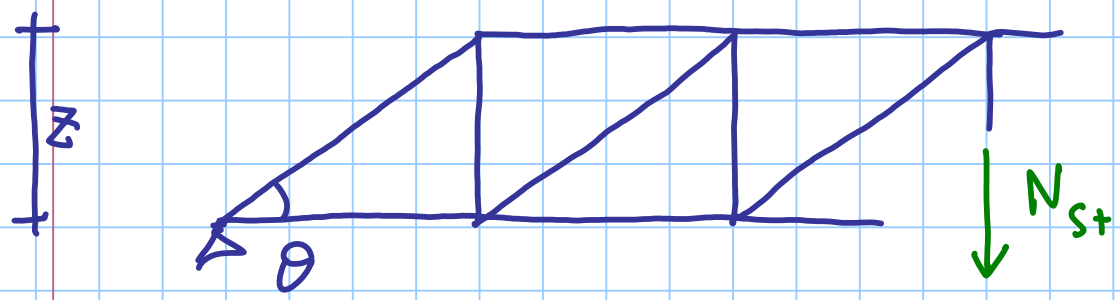






MODELLO A "INCLINAZIONE VARIABILE" DEL TRALICCIO

PUNTONE



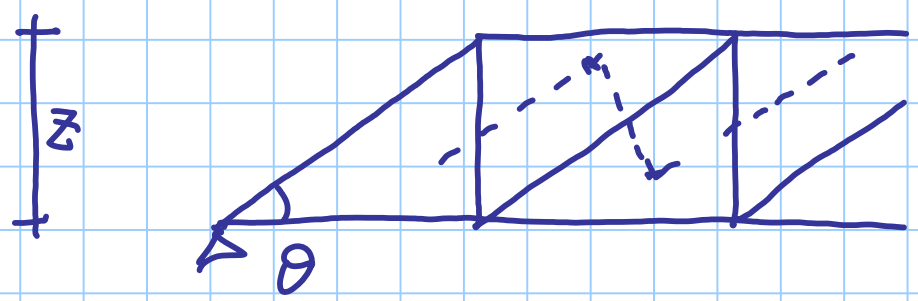
$N_{st} = V$

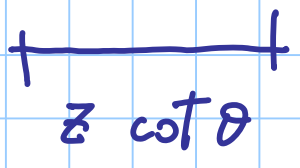
$\cot\theta \geq 1$

$1 \leq \cot\theta \leq 2{,}5$

$$\sigma_{st} = \frac{N_{st}}{\frac{A_{st}}{s} z \cot\theta} \leq f_{yd}$$

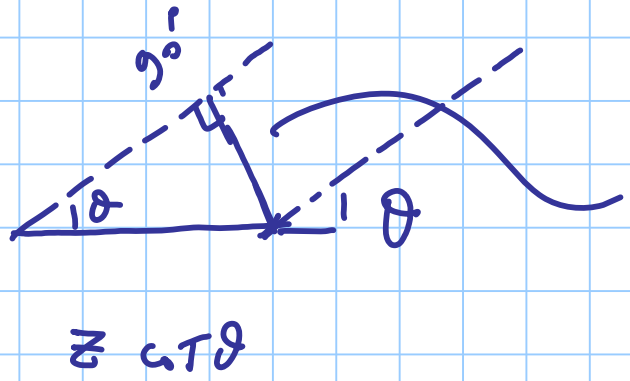
$$V_{Rd,s} = \frac{A_{st}}{s} z f_{yd} \cot\theta$$





$$N_{prin} = \frac{V}{\sin\theta}$$

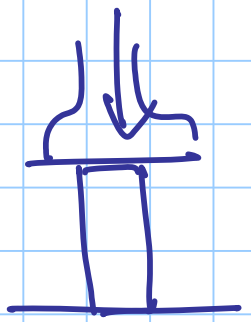
$$A_{prin} = z \cos\theta \; b$$



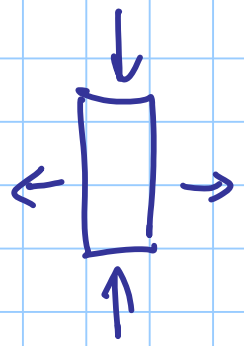
$$z \cot\theta \cdot \sin\theta = z \cos\theta$$

$$\sigma_c = \frac{N_{prin}}{A_{prin}} = \frac{V}{b\, z \sin\theta \cos\theta}$$

$$\sigma_c = \frac{V}{b\, z \sin\theta \cos\theta} \leq \nu f_{cd}$$



f_c in situazioni monoassiali



resistenza minore $\nu < 1$

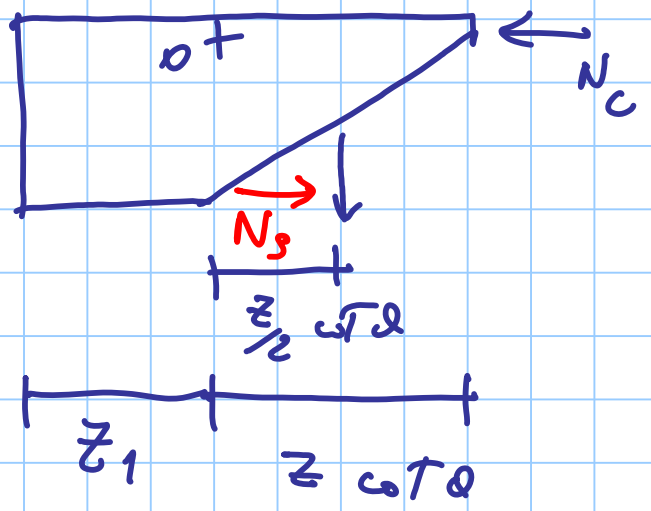
per il comp. biassiale

$$\nu = 0.5$$

$$V_{Rd,max} = b\, z\, \nu\, f_{cd} \sin\theta \cos\theta$$

$$\sin\vartheta\cos\vartheta = \frac{\sin\vartheta\cos\vartheta \;/\sin^2\vartheta}{(\sin^2\vartheta+\cos^2\vartheta)/\sin^2\vartheta} = \frac{\cot\vartheta}{1+\cot^2\vartheta}$$

$$V_{R1,max} = b\,z\,\nu\,f_d\,\frac{\cot\vartheta}{1+\cot^2\vartheta}$$



traslazione del diagramma del momento di $\frac{z}{2}\cot\vartheta$

oppure con ferri di parete

campi di tensione $\longrightarrow V\cot\vartheta$

$A_{st} \geq 0.15\ b$

cm^2/m $\quad$ cm

$b = 30$ $\quad$ $A_{st} \geq 4.5\ cm^2/m$

$\phi 8 \rightarrow A = 0.5\ cm^2$

bracci 2 $\rightarrow A = 1.0\ cm^2$

$\phi 8/20$ $\quad$ va bene

travi a spessore $\quad$ $s \leq 0.8\ d$

solaio $h = 24$ cm $\quad$ $\phi 8/15$ $\quad$ meglio 4 bracci

$b = 30$ cm $h = 60$ cm $d = 56$ cm $z = 0.9 \times 56 = 50.4$ cm $f_{cd} = 14.17$ MPa

$\phi 8/20$ $\frac{A_{sw}}{s} = 5.0$ cm^2/m $\nu = 0.5$

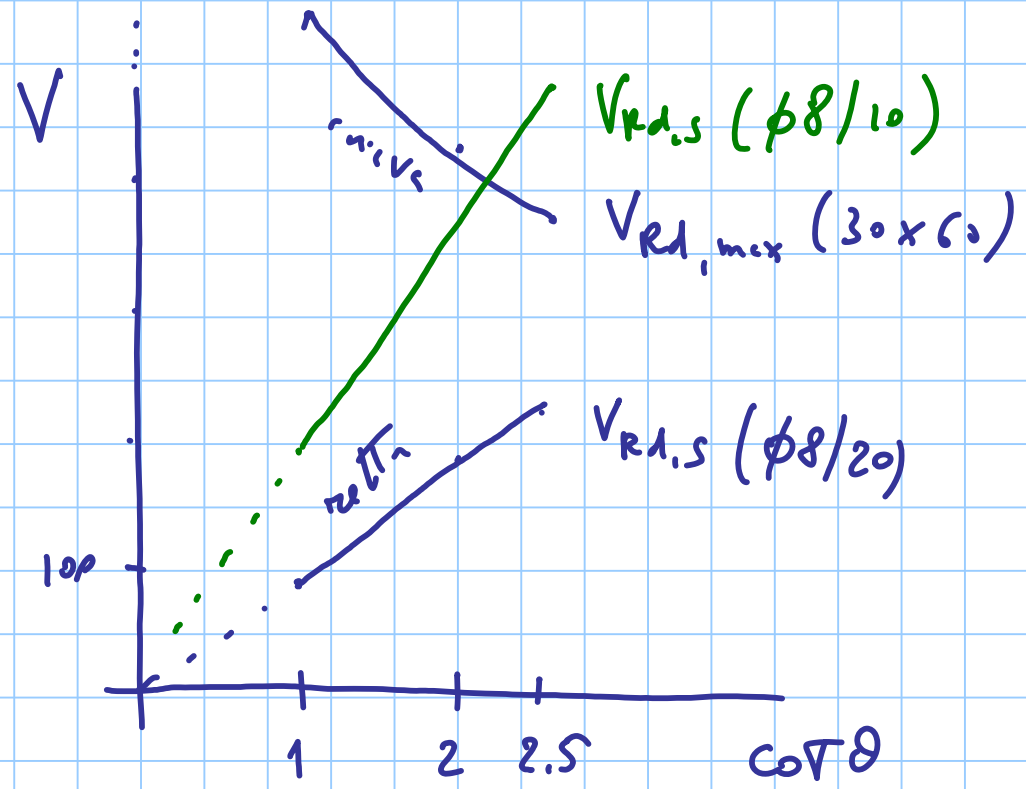
2 bracci $f_{yd} = 391.3$ MPa

$$V_{Rd,max} = b z \nu f_{cd} \frac{\cot\vartheta}{1+\cot^2\vartheta} = 1071.3 \frac{\cot\vartheta}{1+\cot^2\vartheta}$$

$$V_{Rd,s} = \frac{A_{sw}}{s} z f_{yd} \cot\vartheta = 98.6 \cot\vartheta$$

per $\cot\vartheta = 2$ $V_{Rd,s} = 197.2$ kN $V_{Rd,max}$ è sempre maggiore

2.5 $V_{Rd,s} = 246.5$ kN



$$V_{Rd} = MIN\left(V_{Rd,s} ; V_{Rd,max}\right)$$

$$V_{Rd,max} = b z \nu f_{cd} \frac{\cot\theta}{1+\cot^2\theta}$$

$$V_{Rd,s} = \frac{A_{sw}}{s} z f_{yd} \cot\theta$$

$$V_{Rd,max} = V_{Rd,s} \Rightarrow b \cancel{z} \nu f_{cd} \frac{\cancel{\cot\theta}}{1+\cot^2\theta} = \frac{A_{sw}}{s} \cancel{z} f_{yd} \cancel{\cot\theta}$$

$$\frac{b \nu f_{cd}}{\frac{A_{sw}}{s} f_{yd}} = 1+\cot^2\theta$$

$$\cot\vartheta = \sqrt{\frac{b\,\nu\,f_{cd}}{\frac{A_{ST}}{s}\,f_{y1}} - 1}$$

30 x 60

f8/10

$$\cot\vartheta = \sqrt{\frac{30 \times 0.5 \times 14.17}{\frac{10.0}{100} \times 391.3} - 1} = 2.105$$

Se voglio progettare la $\frac{A_{st}}{s}$ necessaria

V_{Ed}

sezione $\rightarrow$ $V_{Rd,max} = \text{val} \dfrac{\cot\theta}{1+\cot^2\theta}$

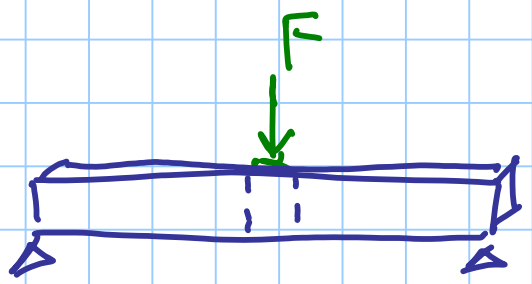
1) calcolo $V_{Rd,max}$ con $\cot\theta = 2.5$ $(\cdot\ 2.0)$

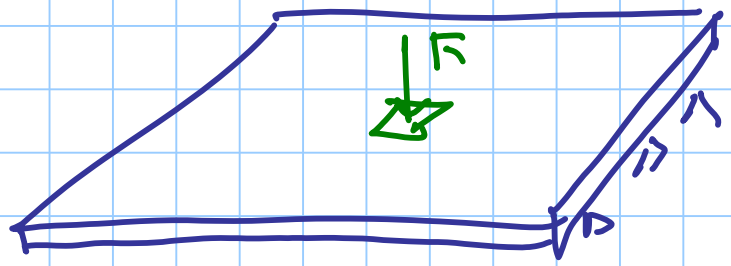
2a) - se $> V_{Ed}$ uso quest. $\cot\theta \Rightarrow \dfrac{A_{st}}{s} = \dfrac{V_{Ed}}{z f_{yd} \cot\theta}$

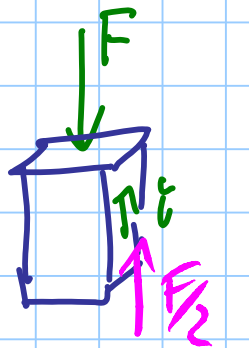
2b) - altrimenti: calcolo $\cot\theta$ per cui $V_{Ed} = V_{Rd,max}$

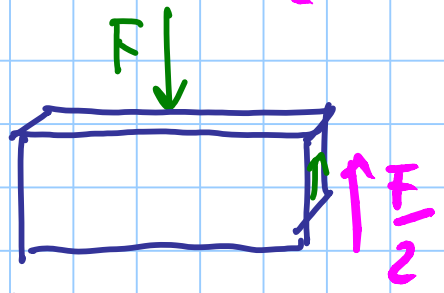
poi calcolo $\frac{A_{st}}{s}$

TAGLIO E PUNZONAMENTO

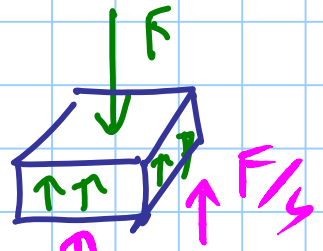


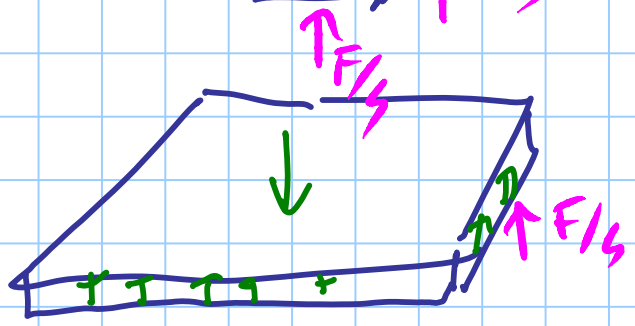




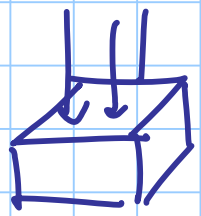


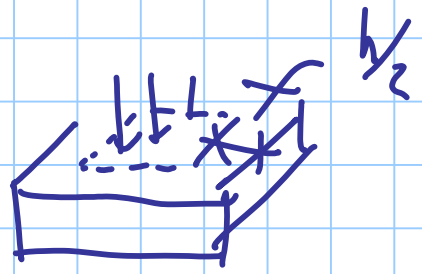
le τ non cambiano

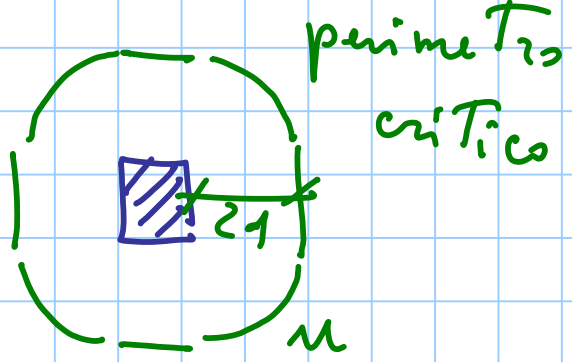


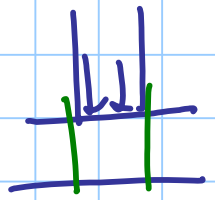


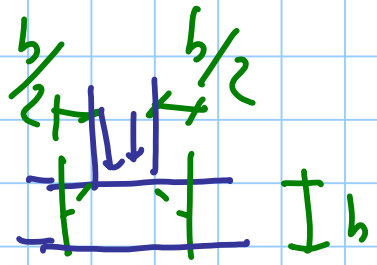
le τ si riducono

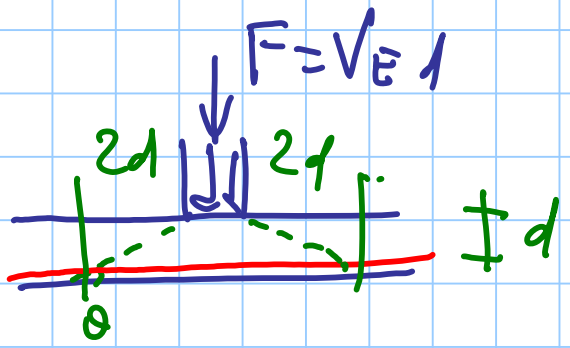












$$\cot\theta = 2$$

$$v_{Ed} = \frac{V_{Ed}}{u\,d}\,\beta$$