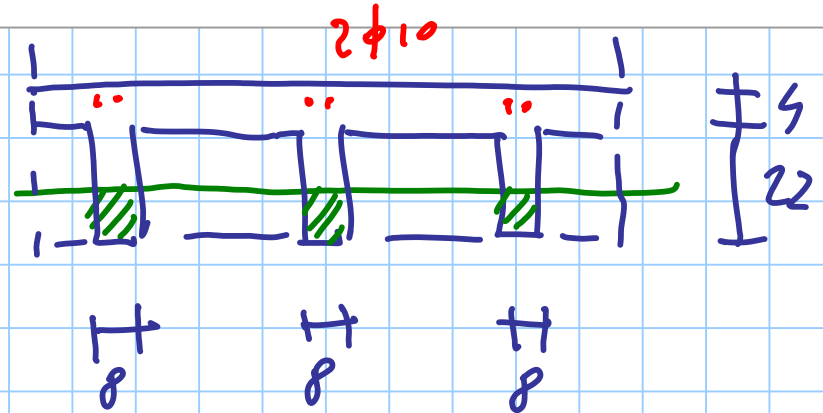
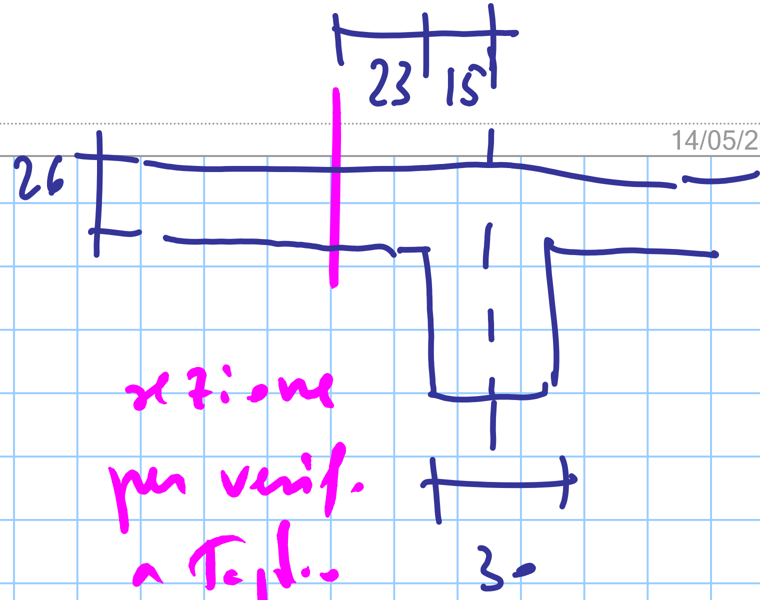
C25/30 ← 100 →

Titolo nota 14/05/2014

arm. Tese

parte compress.



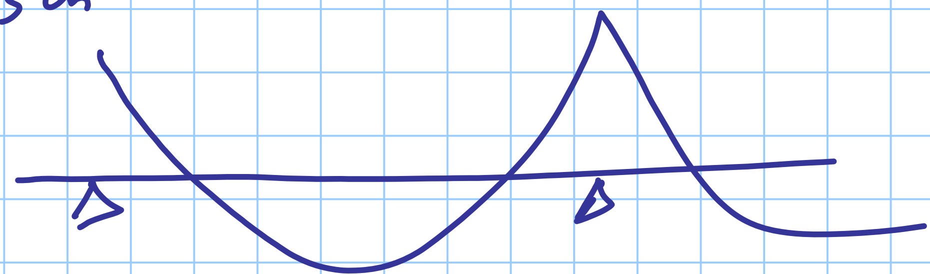


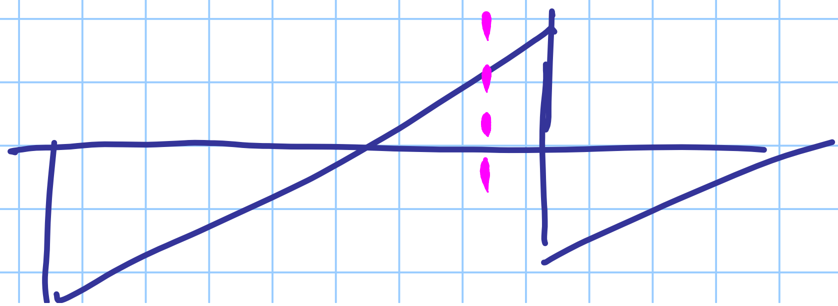
sezione per verif. a Taglio

c = 3 cm

d = 23 cm

Ved





$$\frac{0.18}{\gamma_c} K \sqrt[3]{100 \rho_\ell f_{ck}} = \frac{0.18}{1.5} \times 1.933 \times \sqrt[3]{100 \times 0.00848 \times 25}$$

$$= 0.642 \text{ MPa}$$

$$K = 1 + \sqrt{\frac{200}{d}} = 1 + \sqrt{\frac{200}{230}} = 1.933 \quad \leq 2$$

d mm

$$\rho_\ell = \frac{A_s}{bd} = \frac{4.68}{24 \times 23} = 0.00848 \quad \leq 0.02$$

$$A_s = 3 \times 2 \times 0.78 = 4.68 \text{ cm}^2$$

$$b = 3 \times 8 = 24 \text{ cm}$$

$$0{,}035\sqrt{K^3 f_{ck}} = 0.035\sqrt{1.933^3 \times 25} = 0.470$$

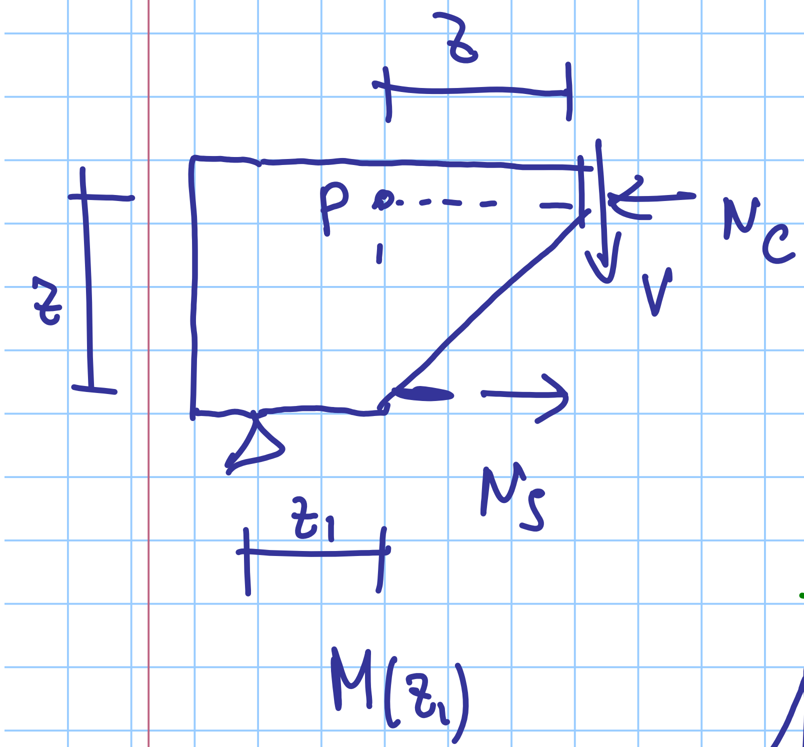
MPa

0.642 MPa

0.470 MPa

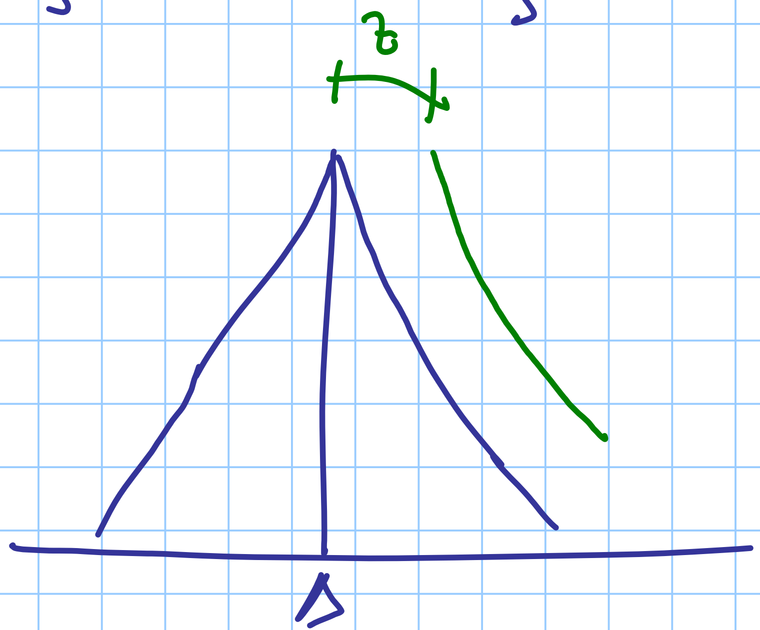
uso il più grande 0.642 MPa

$$V_{Rd_c} = 0.642 \times 24 \times 23 \times 10^{-1} = 35.4 \text{ KN}$$

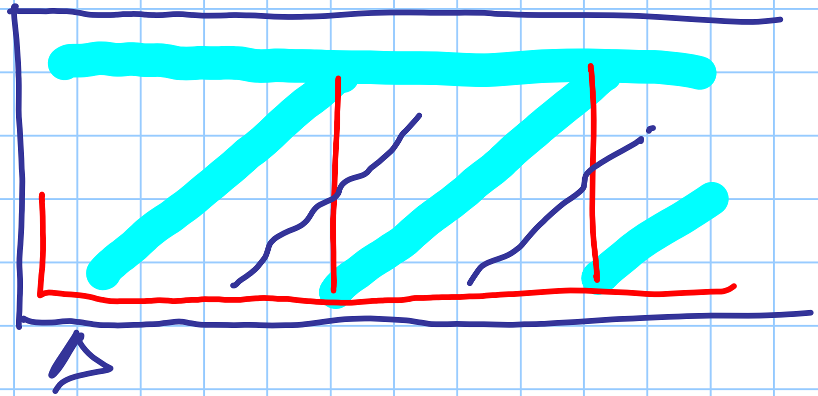


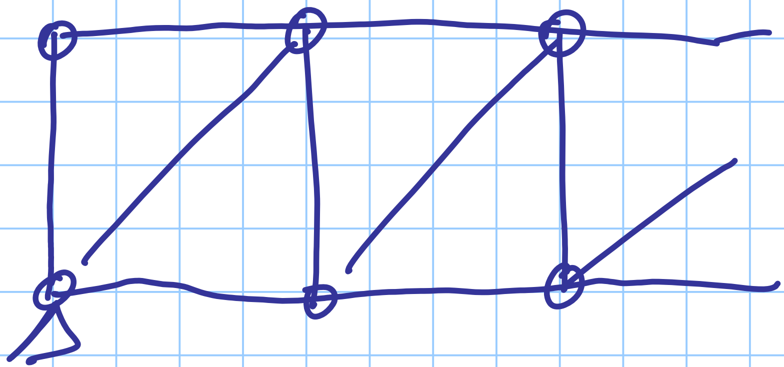
$$M(z_1) = N_s\, z - V\, z$$

$$N_s = \frac{M(z_1) + V\, z}{z} = \frac{M(z_1 + z)}{z}$$

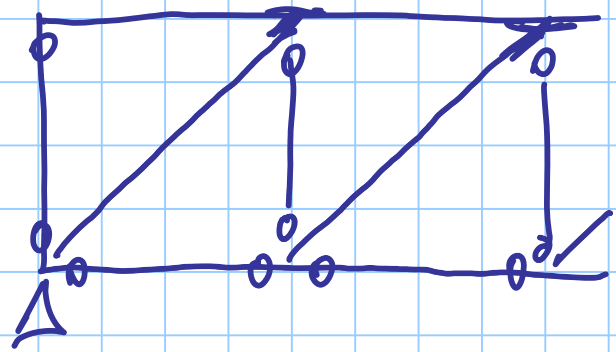


ARMATURA A TAGLIO

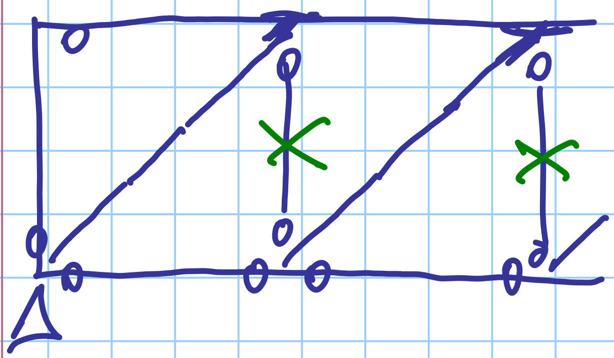




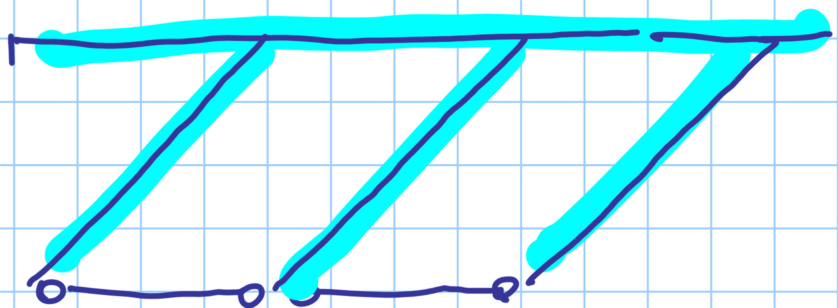
TRALICCIO DI MÖRSCH



TRALICCIO IPERSTATICO



TRALICCIO IPERSTATICO



PETTINE

96 EC2 fino '90 (vecchie norme) $V_{Rd} = V_{wd} + V_{cd}$

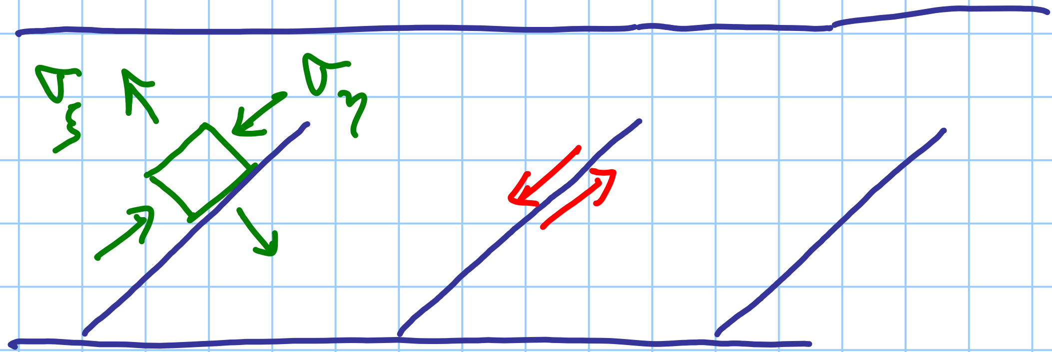
quando le staffe si snervano

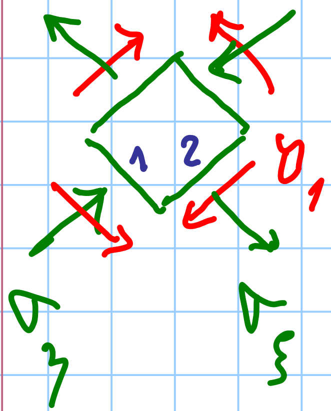
V_{wd} resist. staffe (Traliccio)

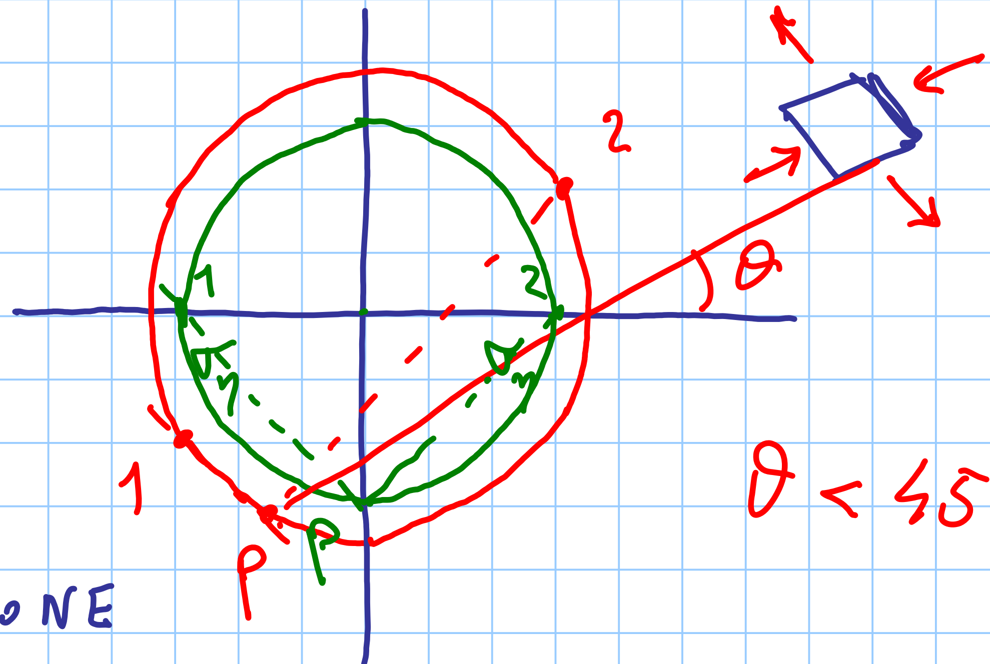
se incremento il carico c'è ancora il "pettine"

$+ V_{cd}$ resist. pettine

METODO "NORMALE"

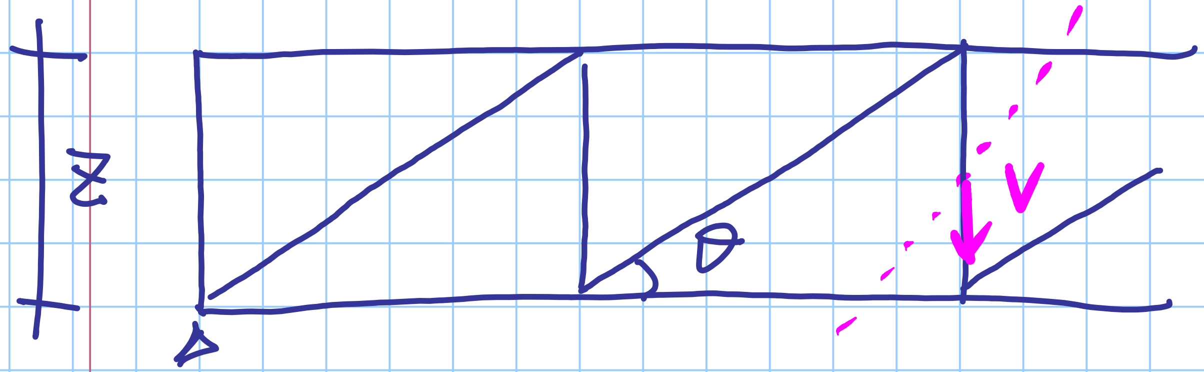


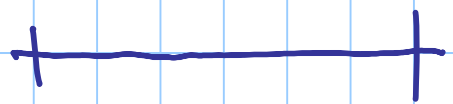




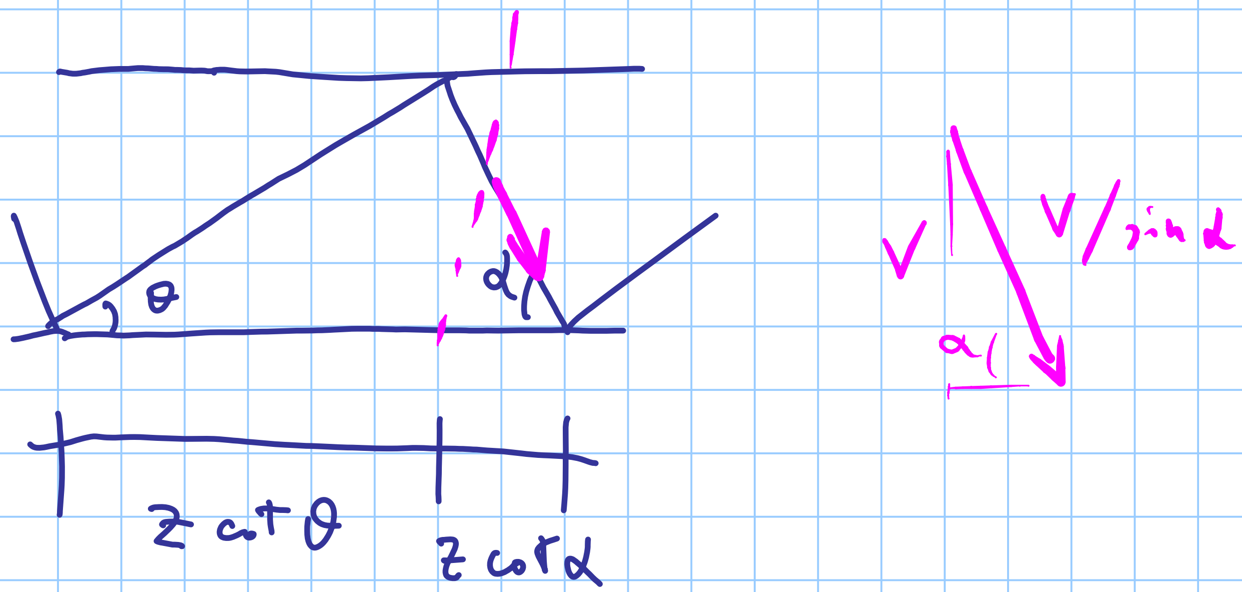
$\theta < 45°$

INCLINAZIONE VARIABILE DEL PUNTONE





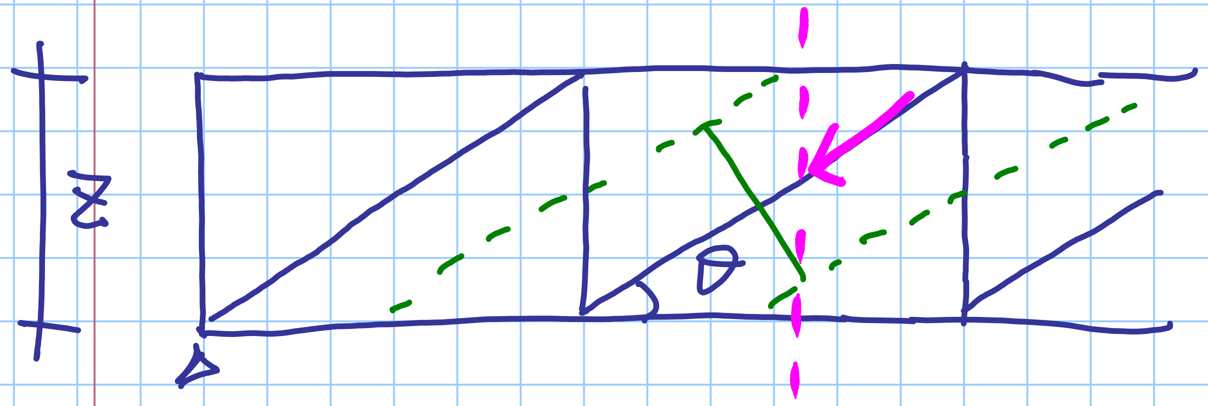
$$\frac{A_{ST}}{s} \cdot z \cot\theta \cdot f_{yd} = V_{Rd,s}$$

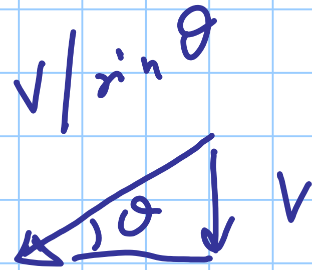


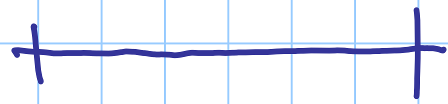
$$V_{Rd,s} = \frac{A_{sw}}{s} z f_{yd} (\cot\theta + \cot\alpha)\sin\alpha$$

staffe $\alpha = 90°$

sagomati $\alpha = 45°$

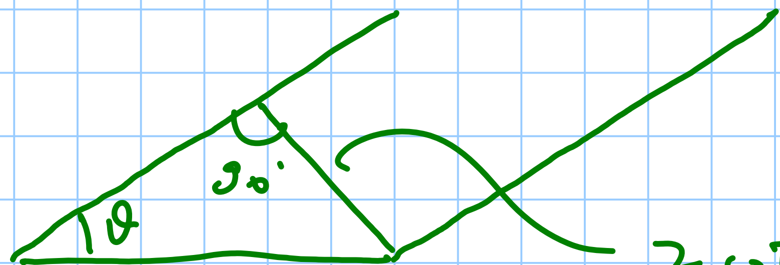






$z \cot\theta$

$A_c = b\, z \cos\theta$

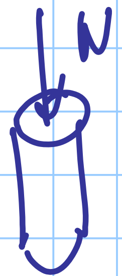


$z \cot\theta \cdot \sin\theta = z \cos\theta$

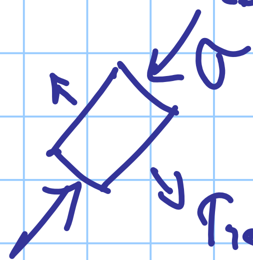
$z \cot\theta$

$$\sigma = \frac{V/\sin\theta}{b\,z\cos\theta} = \frac{V\,(\sin^2\theta+\cos^2\theta)/\sin^2\theta}{b\,z\sin\theta\cos\theta\,/\sin^2\theta}$$

$$\sigma = \frac{V\,(1+\cot^2\theta)}{b\,z\cot\theta} \le \underbrace{\nu_1}_{0,5} f_{cd}$$



si rompe a f_{cd}



compr. si rompe prima

Traz. per il tagl.

la rottura a taglio per schiacciamento del puntone

avviene per

$$V_{Rd,max} = b\, z\, \nu_1\, f_{cd}\, \frac{\cot\vartheta + \cot\alpha}{1+\cot^2\vartheta}$$

$\alpha = 90°$ → staffe

VERIFICA assegnate: sezione

armatura a taglio

determinare $V_{Rd} = MIN(V_{Rd,s} ; V_{Rd,max})$

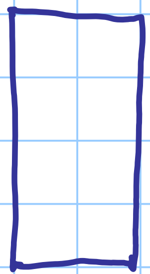
$$V_{Rd,s} = \frac{A_{st}}{s} z f_{yd} \cot\theta$$

$$V_{Rd,max} = b z \nu_1 f_{cd} \frac{\cot\theta}{1+\cot^2\theta}$$

staffe $\phi 8/20$

$d = 66$ cm

$z = 0.9 \times 66 = 59.4$ cm

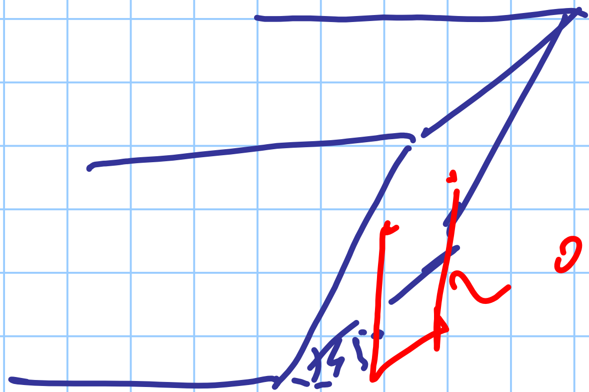
70 

30

$c = 4$ cm

$$\frac{2 \times 0.5 \text{ cm}^2}{20 \text{ cm}}$$

$$\frac{2 \times 0.5 \times 5 \text{ cm}^2}{100 \text{ cm}}$$



0.5 cm²

la staffa ha due bracci che attraversano la sezione

$$\frac{A_{st}}{s} = 5.0 \text{ cm}^2/\text{m}$$

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

$$= \frac{5.0}{100} \times 59.4 \times 391.3 \times 10^{-1} \quad \times \cot\vartheta =$$

$$= 116.2 \quad \cot\vartheta$$

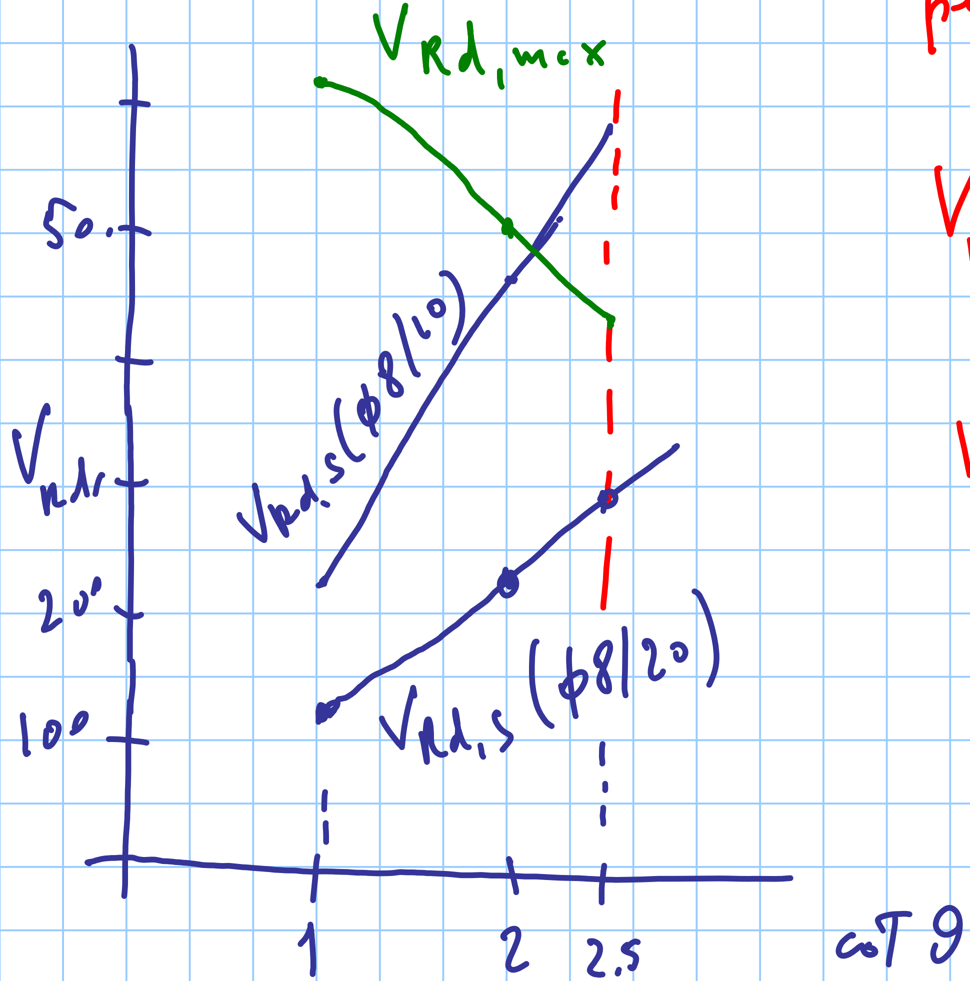
$$V_{Rd,max} = b\, z\, \nu_1\, f_{cd} \frac{\cot\theta}{1+\cot^2\theta} =$$

$$= 30 \times 59.4 \times 0.5 \times 14.2 \times 10^{-1} \frac{\cot\theta}{1+\cot^2\theta} =$$

$$= 1265 \frac{\cot\theta}{1+\cot^2\theta}$$

$\cot\theta = 1$ | 2 | 2.5

$\frac{\cot\theta}{1+\cot^2\theta} = 0.5$ | 0.4 | 0.345



per $\cot\vartheta = 2.5$

$$V_{Rd,s} = 116.2 \times 2.5 = 290 \text{ kN}$$

$V_{Rd,max} > V_{Rd,s}$ OK

$$V_{Rd} = 290 \text{ kN}$$

staffe $\phi 8/10$ $10\ cm^2/m$

$$V_{Rd,s} = 232,4 \cot\theta$$

IL MASSIMO SI HA PER $V_{Rd,s} = V_{Rd,max}$

$$\frac{A_{st}}{s} \cancel{z} f_{yd} \cancel{\cot\theta} = b \cancel{z} \nu_1 f_{cd} \frac{\cancel{\cot\theta}}{1+\cot^2\theta}$$

$$1 + \cot^2\vartheta = \frac{b\, \nu_1\, f_{cd}}{\frac{A_{st}}{s}\, f_{yd}}$$

$$\cot\vartheta = \sqrt{\frac{b\, \nu_1\, f_{cd}}{\frac{A_{sT}}{s}\, f_{yd}} - 1} =$$

$$= \sqrt{\frac{30 \times 0.5 \times 14,2}{\frac{10}{100}\, 391,3} - 1} = 2,108$$

$$V_{Rd} = 232,4 \times 2,108 = 489,9 \text{ KN}$$

PROGETTO dato V_{Ed} e sezione

calcolare $\frac{A_{st}}{s}$

1) assumo $\cot\theta = 2$ (o 2.5)

calcolo $V_{Rd,max}$ per questo $\cot\theta$

2) — se $V_{Rd,max} \geq V_{Ed}$ uso $V_{Rd,s} = \ldots$ con $\cot\theta$ per calcolare A_{st}/s

— $V_{Rd,max} < V_{Ed}$

trovo $\cot\theta$ da $V_{Rd,max} = V_{Ed}$

TRASLAZ. DIAGR. MOM.

(o comp. orizzontale)

dal modello di campi di tensione