

Corso di laurea in Ingegneria civile strutturale e geotecnica

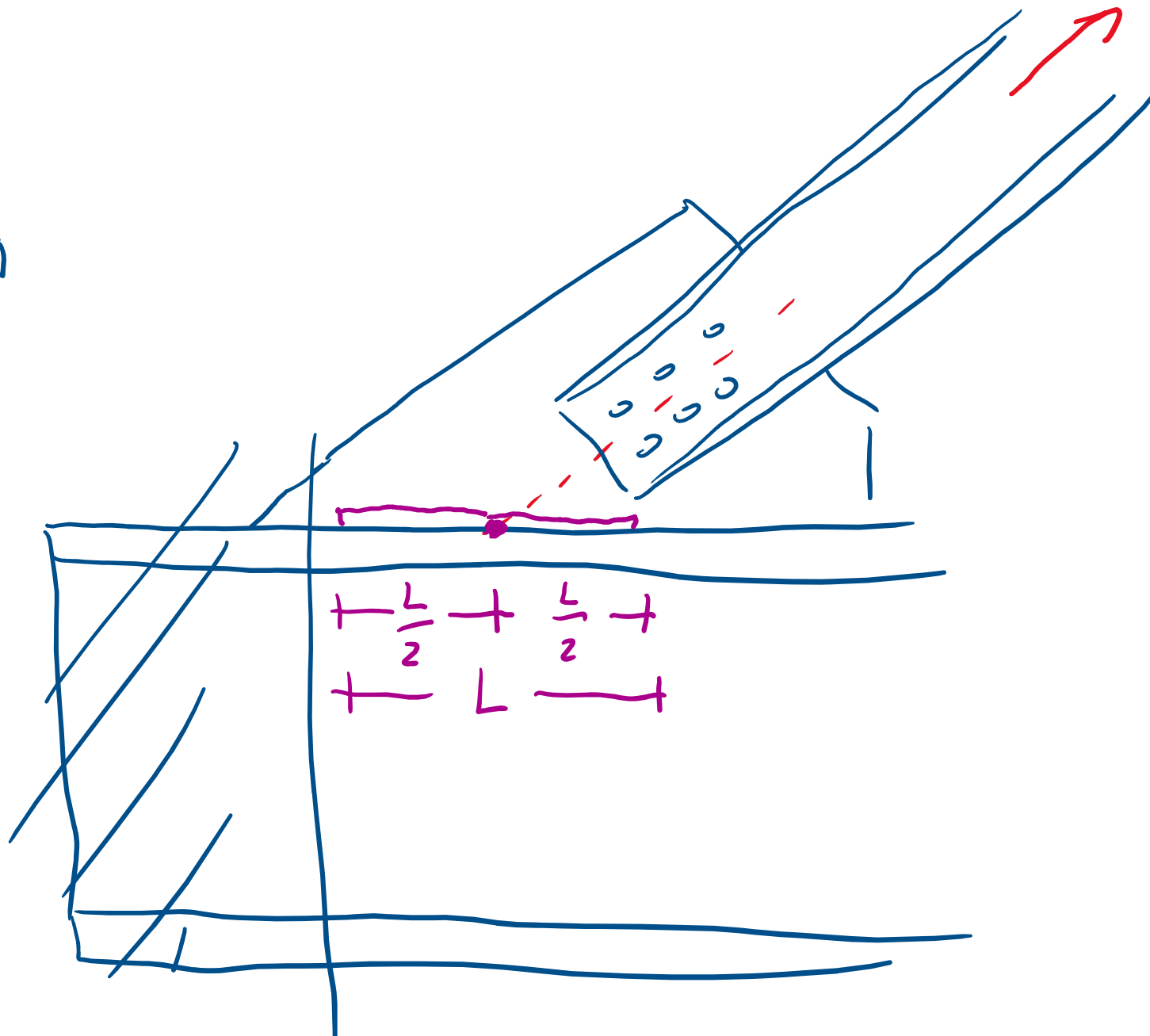
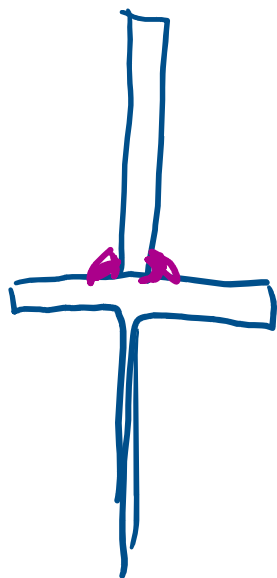
# Tecnica delle costruzioni

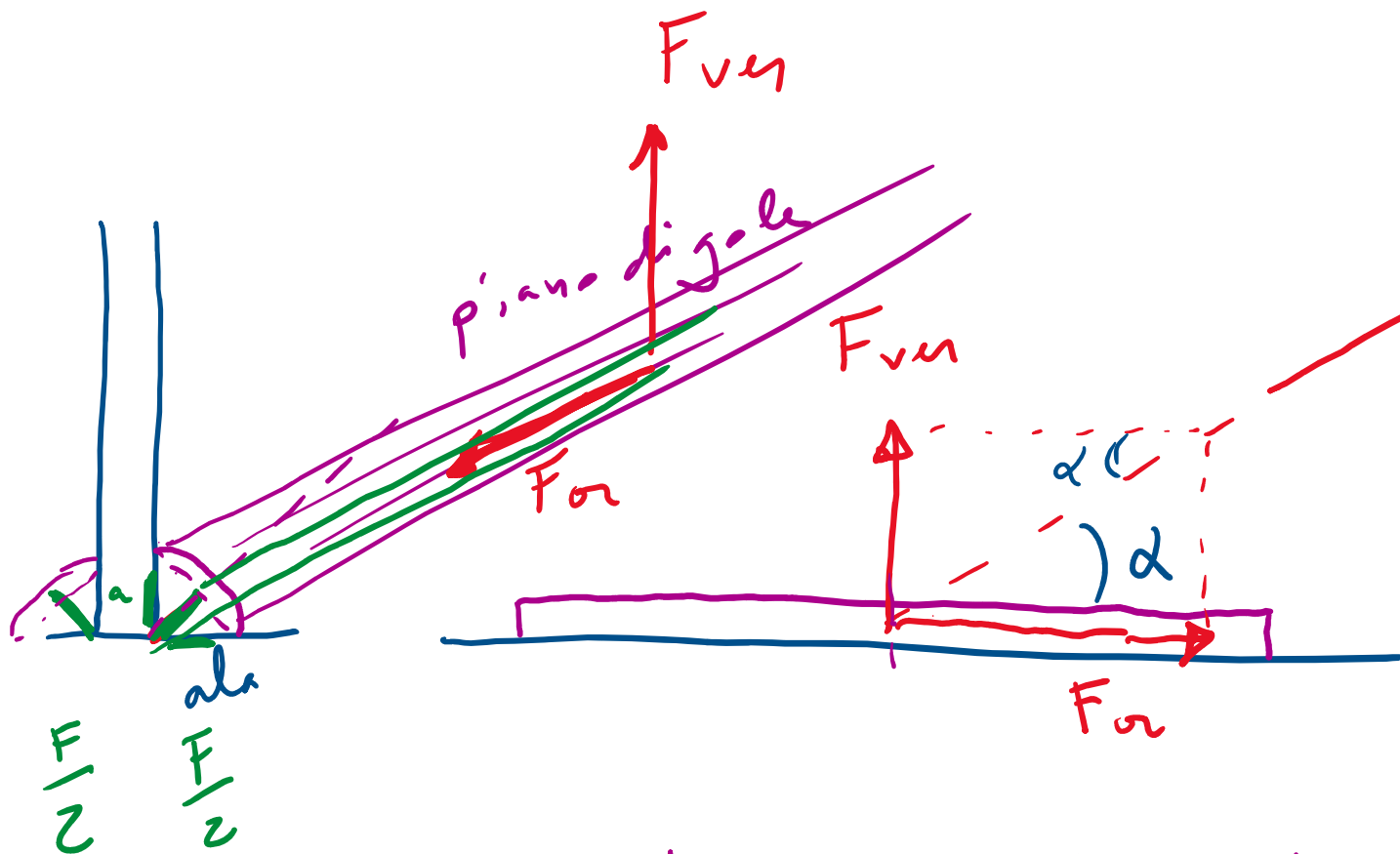
## modulo A

26 - Collegamenti

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14/12/2020





$$F_{\text{perp}} = F \sin \alpha$$

$$F_{\text{par}} = F \cos \alpha$$

$$F_{\text{par}} \Rightarrow \tau_{\parallel}$$

$$F_{\text{perp}} \Rightarrow \tau_{\perp}$$

$$+ \frac{L}{2} \quad + \quad \frac{L}{2}$$

$$\tau_{\parallel}$$

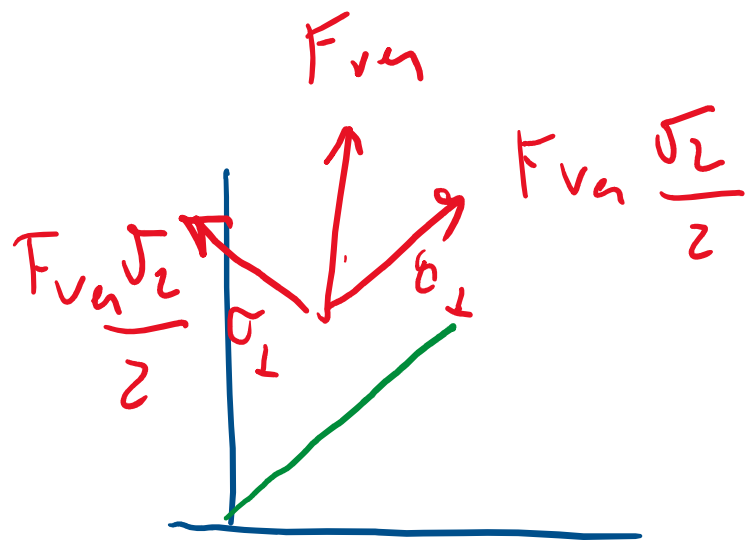
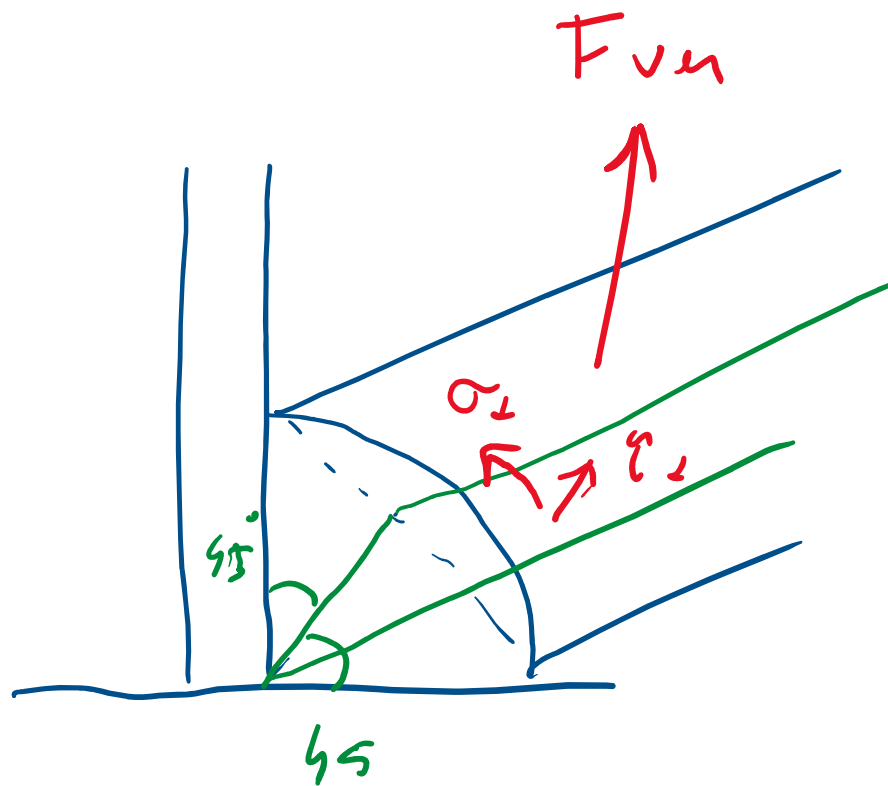
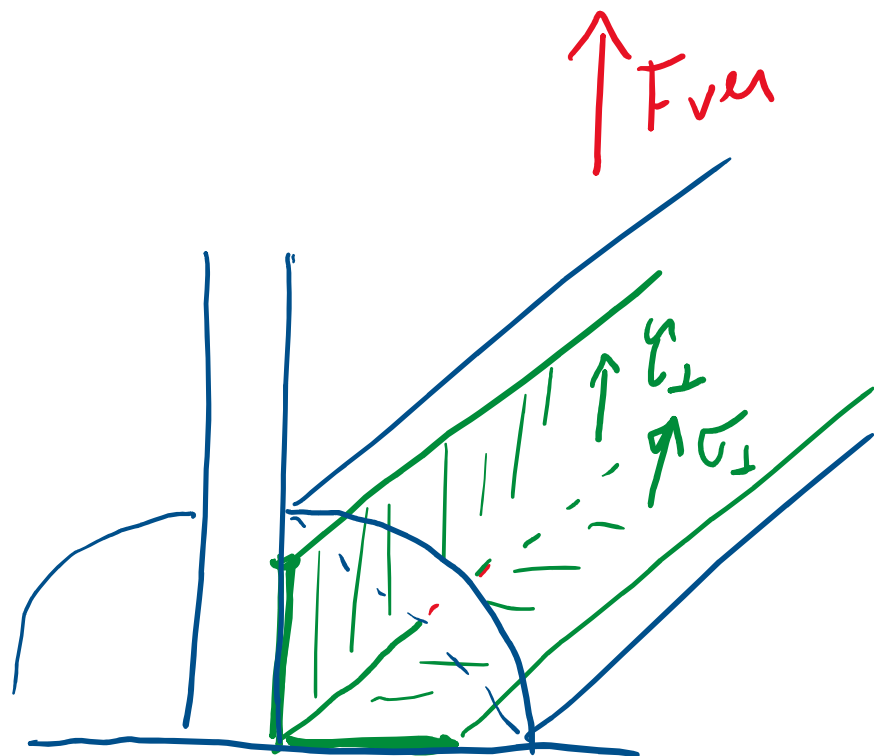
$$\tau_{\perp}$$

$$\sigma_{\perp}$$

$$\tau_{\parallel} = \frac{F_{\text{par}}}{a l}$$

$$\tau_{\perp} = \frac{F_{\text{perp}} \sqrt{2}/2}{a l}$$

$$\sigma_{\perp} = \frac{F_{\text{perp}} \sqrt{2}/2}{a l}$$



ELLIPSOIDE

$$\sqrt{\sigma_{\perp}^2 + 3(\gamma_{\parallel}^2 + \gamma_{\perp}^2)} \leq f_{\text{wd}} = \frac{f_u}{\beta_w \gamma_{n2}}$$

SFERA

$$\sqrt{\sigma_{\perp}^2 + \gamma_{\parallel}^2 + \gamma_{\perp}^2} \leq f_{\text{vwd}} = \frac{f_{\text{wd}}}{\sqrt{3}} = \frac{f_u / \sqrt{3}}{\beta_w \gamma_{n2}}$$

$\bar{e}$  come a far

$$\sqrt{3\sigma_{\perp}^2 + 3(\gamma_{\parallel}^2 + \gamma_{\perp}^2)} \leq f_{\text{wd}}$$

$$F = 400 \text{ KN}$$

$$S 275$$

$$f_y = 430 \text{ MPa}$$

$$2 \text{ cordoni (simmetrici)} \quad \text{con} \quad a = 6 \text{ mm} \quad l = 160 \text{ mm}$$

$$\alpha = 27^\circ \quad \sin \alpha = 0.454 \quad \cos \alpha = 0.891$$

$$F_{ve1} = 181.6 \text{ KN}$$

$$L \times \frac{\sqrt{2}}{2} = 128.4$$

$$\tau_{\perp} = \frac{128.4 \times 10^3}{2 \times 6 \times 160} = 66.9 \text{ MPa}$$

$$F_{v2} = 356.4 \text{ KN}$$

$$\tau_{//} = \frac{356.4 \times 10^3}{2 \times 6 \times 160} = 185.6 \text{ MPa}$$

$$\sigma_{\perp} = 66.9 \text{ MPa}$$

$$f_{wd} = \frac{430}{0.85 \times 1.25} = 404.7 \text{ MPa}$$

ELLIPSOIDE

$$\sqrt{66.9^2 + 3(185.6^2 + 66.9^2)} \leq 404.7$$

$$\sqrt{4475.6 + 3(34447.4 + 4475.6)} =$$

$$= 348.2 \text{ MPa} < 404.7 \text{ MPa} \quad \text{OK verification}$$

$$348.2 / 404.7 = 0.860$$

SFERA

$$F_{\max} = \frac{400}{0.86} = 465 \text{ kN}$$

$$\sqrt{66.9^2 + 185.6^2 + 66.9^2} \leq \frac{404.7}{\sqrt{3}} = 233.7 \text{ MPa}$$

$$208.3 < 233.7$$

OK verification

$$208.3 / 233.7 = 0.891$$

$$F_{\max} = \frac{400}{0.891} = 449 \text{ kN}$$

SFERA

$$F = \sqrt{\sigma_{\perp}^2 + \tau_{\perp}^2 + \tau_{//}^2} \cdot a l$$

verifica

$$\frac{F}{a l} \leq f_{vwd}$$

PROGETTO

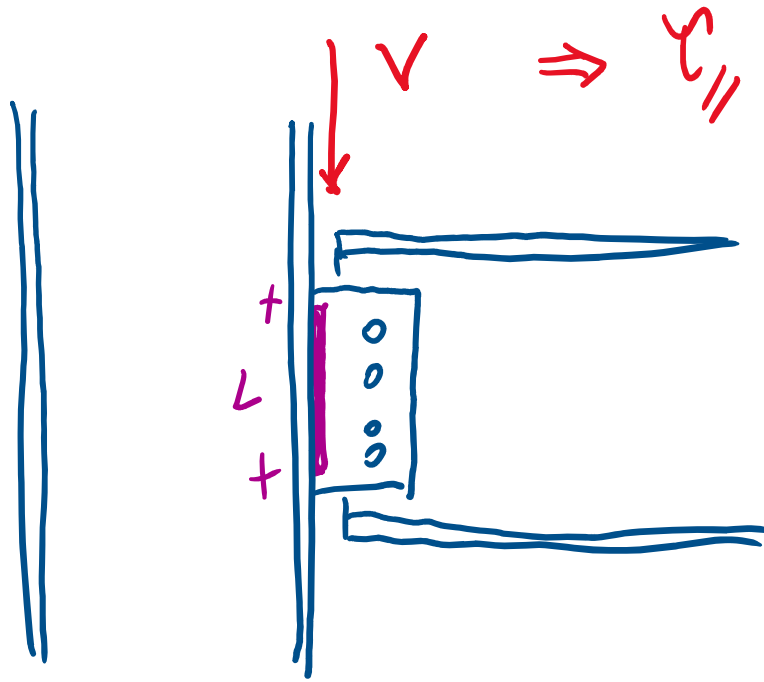
$$(n_{cor}) a l \geq \frac{F}{f_{vwd}}$$

$$\frac{400 \times 10^3}{2 \times 6 \times 160} = 208.3 \text{ MPa} \leq 233.7 \text{ MPa}$$

$$F_{max} = a l f_{vwd} = 2 \times 6 \times 160 \times 233.7 = 449 \text{ kN}$$

$\times 10^{-3}$

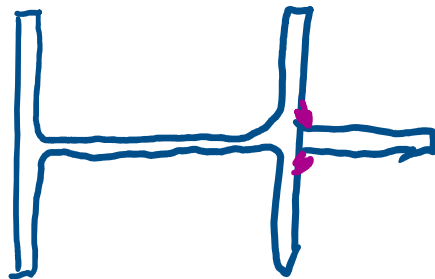




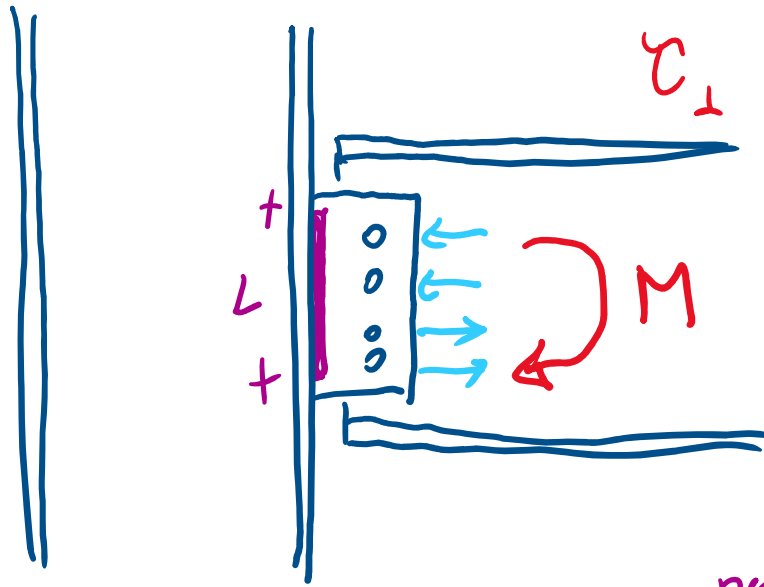
2 cordoni

PROGETTO

$$a_l = \frac{V/2}{f_{vwd}}$$

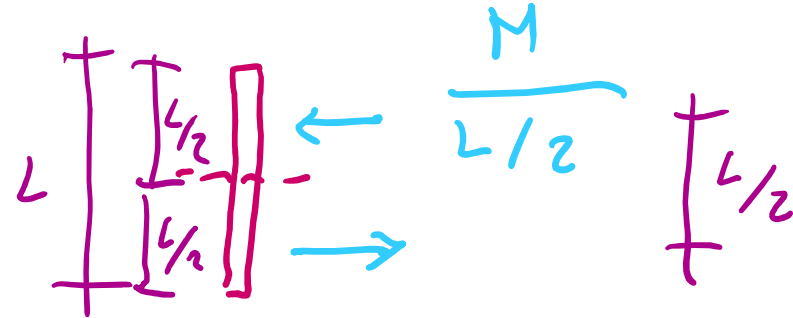


→ per bilanciare  $M$

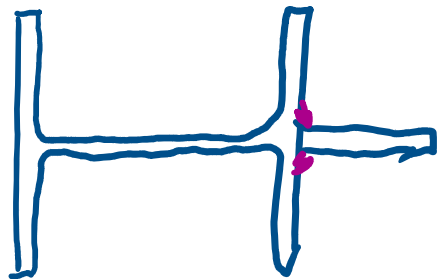


$\sigma_t \sigma_c$

PROGETTO



per mezzo cordon

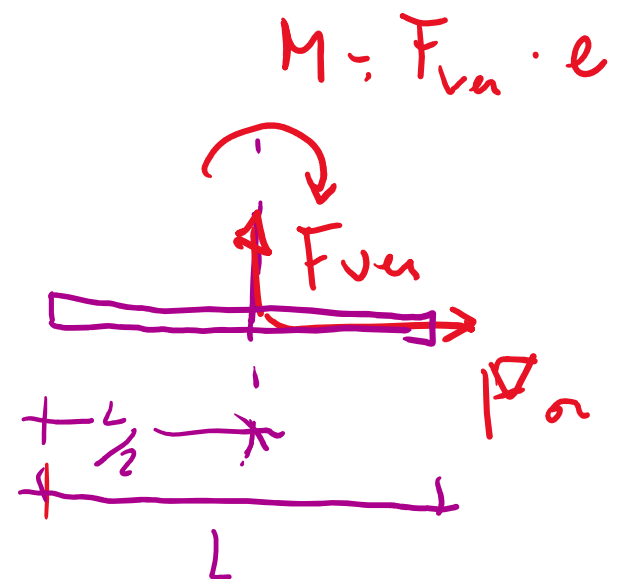
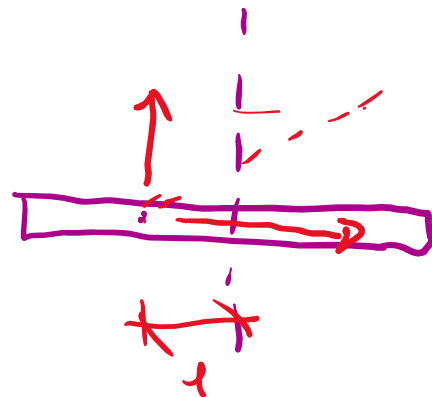
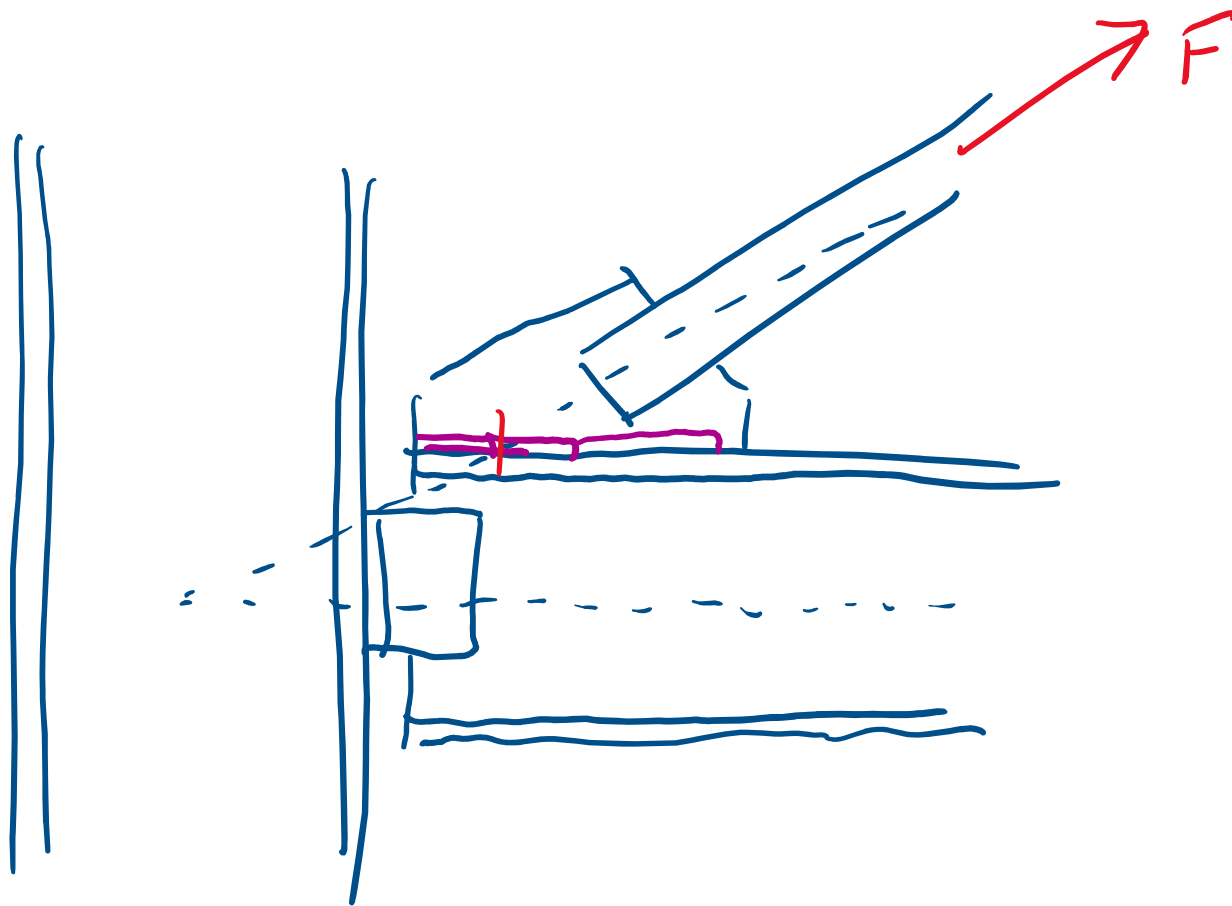


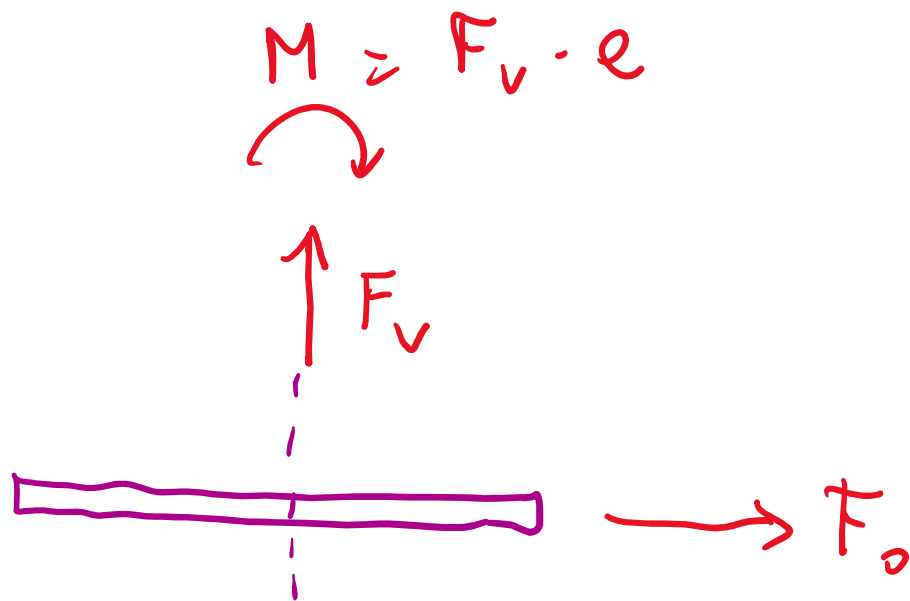
$$2 \left[ a \frac{L}{2} \cdot f_{vwd} \right] = \frac{M}{L/2} = \frac{2M}{L}$$

$$a L^2 \geq \frac{M \cdot 2}{f_{vwd}}$$

2 cordoni

verifica  $\frac{M}{L/2} / 2 a \frac{L}{2} \leq f_{vwd}$



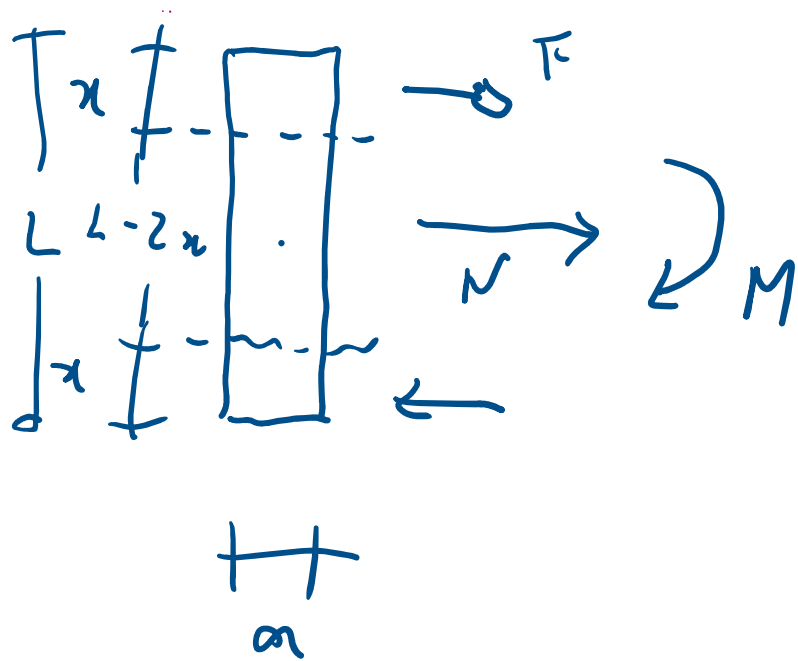


$(1-k)F_v + \frac{2M}{L} \uparrow$

$\uparrow kF_v - \frac{2M}{L}$



$\rightarrow F_o/2$



$$F = \frac{M}{L - x}$$

$$\frac{F}{ax} = \frac{N}{a(L - 2x)}$$

