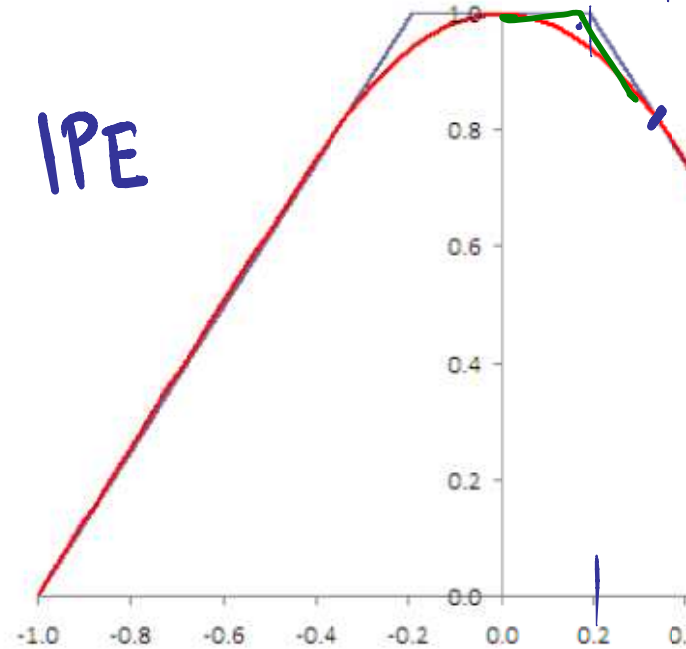


IPE

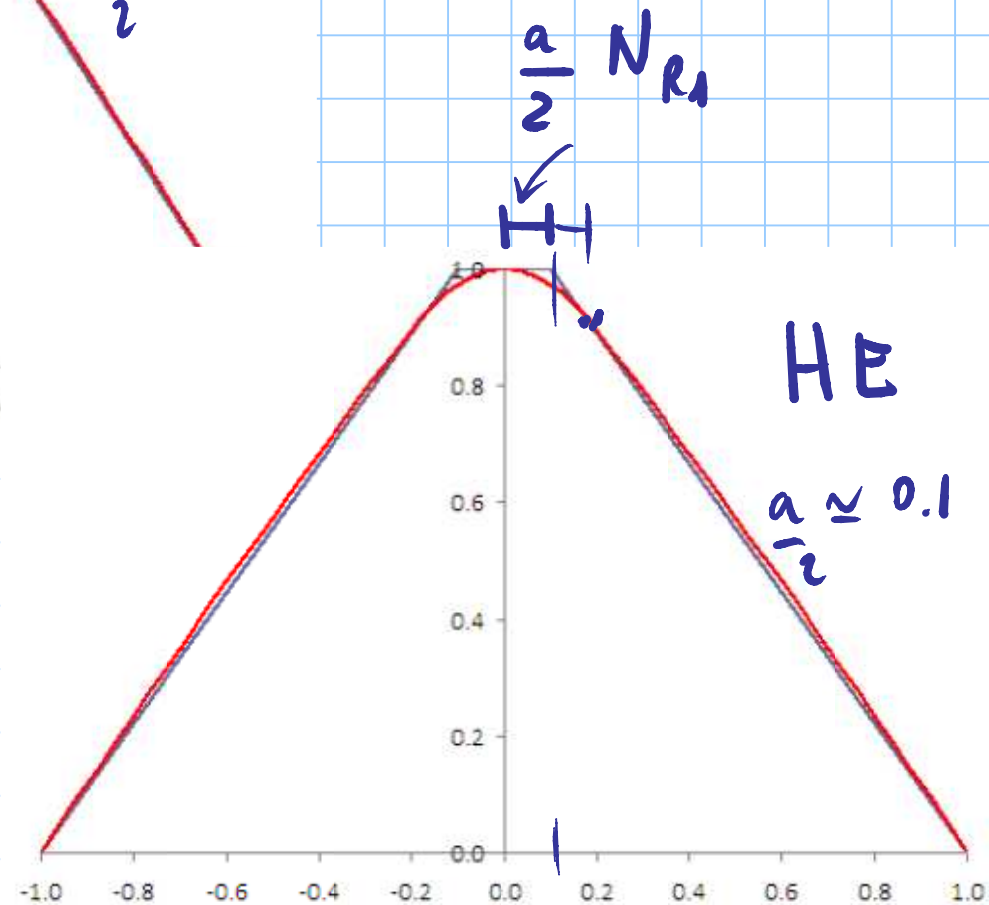


$\frac{a}{2} \approx 0.2$

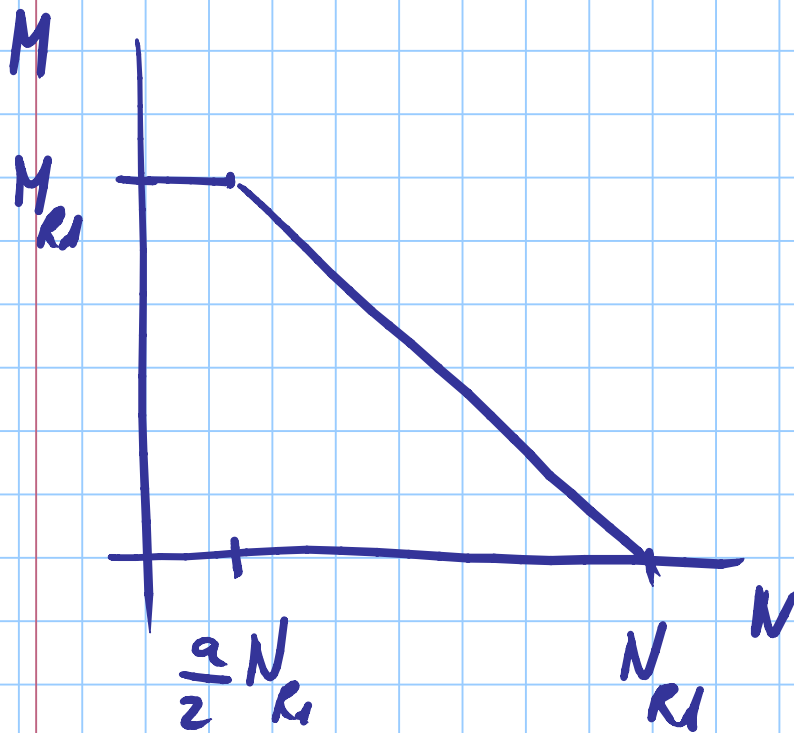
$$a = \frac{A - 2 \beta t_f}{A}$$

) T. Take

HE



$\frac{a}{2} \approx 0.1$



$$\frac{N_{Ed}}{N_{Rd}} = \eta$$

$$\text{se } N_{Ed} \leq \frac{a}{2} N_{Rd}$$

$$M_{N,Ed} = M_{Rd}$$

$$\text{se } N_{Ed} > \frac{a}{2} N_{Rd}$$

$$M_{N,Ed} = M_{Rd} \frac{1 - \eta}{1 - a/2}$$

VERIFICA

HEB 140

$$M_{Ed} = 10 \text{ kNm}$$

$$N_{Ed} = 250 \text{ kN}$$

$$A = 43.0 \times 10^2 \text{ mm}^2$$

$$W_{pl,y} = 245.4 \times 10^3 \text{ mm}^3$$

$$b = 140 \text{ mm}$$

$$t_f = 12 \text{ mm}$$

S 275

$$a = \frac{43.0 \times 10^2 - 2 \times 140 \times 12}{43.0 \times 10^2} = 0.219$$

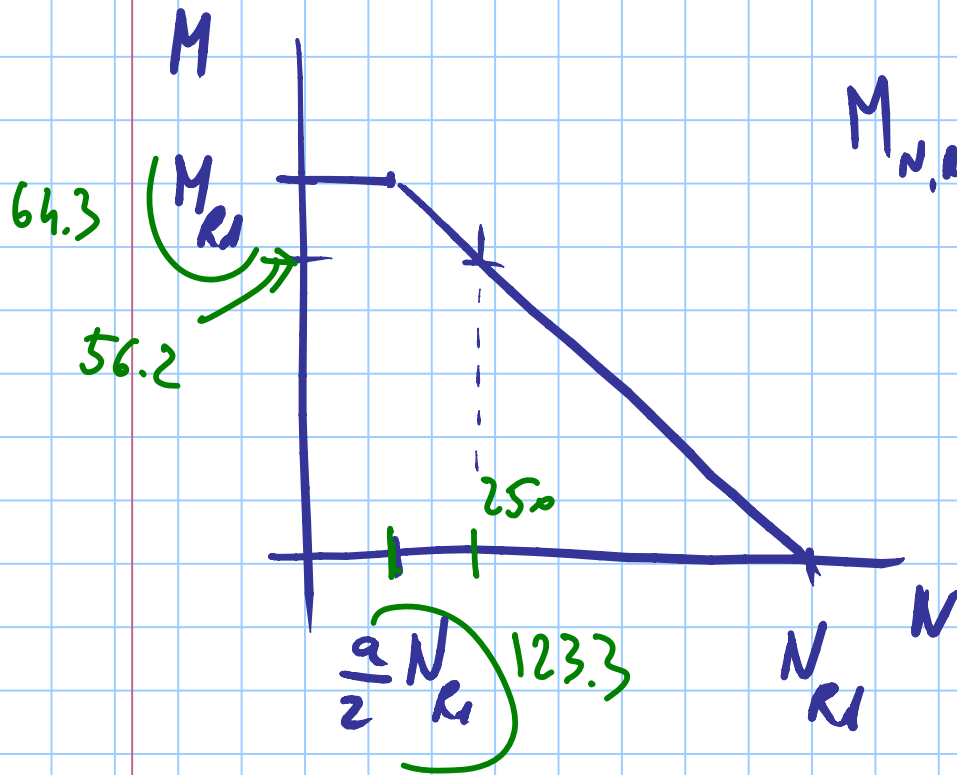
$$N_{Rd} = 43 \times 10^2 \times \frac{275}{1.05} \times 10^{-3} = 1126.2 \text{ kN}$$

$$M_{R1} = 245.4 \times 10^3 \times \frac{275}{1.05} \times 10^{-6} = 64.27 \text{ kNm}$$

$$m = \frac{250}{1126.2} = 0.222$$

$$\frac{a}{2} N_{R1} = 123.3 \text{ kN}$$

$$M_{N,R1} = 64.27 \frac{1 - 0.222}{1 - 0.219/2} = 56.15 \text{ kNm}$$



PROGETTO

S355

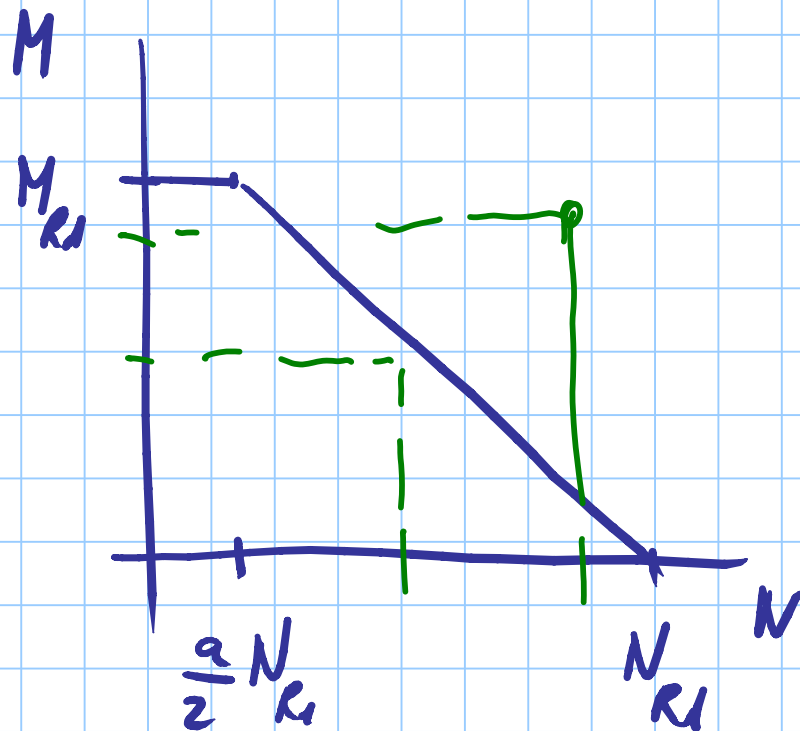
$$M_{Ed} = 300 \text{ kNm}$$

$$N_{Ed} = \cancel{400 \text{ kN}}$$

$$(n_{r1} = 2300 \text{ kN})$$

$$W_{pl} \geq \frac{M_{Ed}}{f_y / \gamma_{M_1}} = \frac{300 \times 10^6}{355 / 1.05} = 887.3 \times 10^3 \text{ mm}^3$$

$$A \geq \frac{N_{Ed}}{f_y / \gamma_{M_0}} = \frac{2300 \times 10^3}{355 / 1.05} = 68.0 \times 10^2 \text{ mm}^2$$



prova IPE 450

$$W_{pl} = 1702 \times 10^3 \text{ mm}^3$$

$$A = 98.8 \times 10^2 \text{ mm}^2$$

$$b = 190 \text{ mm}$$

$$t_f = 14.6 \text{ mm}$$

$$a = \frac{98.8 \times 10^2 - 2 \times 190 \times 14.6}{98.8 \times 10^2} = 0.438$$

$$N_{Rd} = 98.8 \times 10^2 \times \frac{355}{1.05} \times 10^{-3} = 3340 \text{ kN}$$

$$\eta = 0.689$$

$$M_{Rd} = 1702 \times 10^3 \times \frac{355}{1.05} \times 10^{-6} = 575 \text{ kNm}$$

$$M_{N,Rd} = 575 \frac{1 - 0.689}{1 - 0.438/2} = 229 \text{ kNm} < M_{Ed}$$

\bar{e} necesario IPE 500 $A = 116 \times 10^2 \text{ mm}^2$

prova HEB 280

$$W_{pl} : 1534 \times 10^3 \text{ mm}^3$$

$$A : 131.4 \times 10^2 \text{ mm}^2$$

$$B : 280 \text{ mm}$$

$$t_f : 18 \text{ mm}$$

$$a = \frac{131.4 \times 10^2 - 2 \times 280 \times 18}{131.4 \times 10^2} = 0.233$$

$$N_{Ed} = 131.4 \times 10^2 \times \frac{355}{1.05} \times 10^{-3} = 4443 \text{ kN}$$

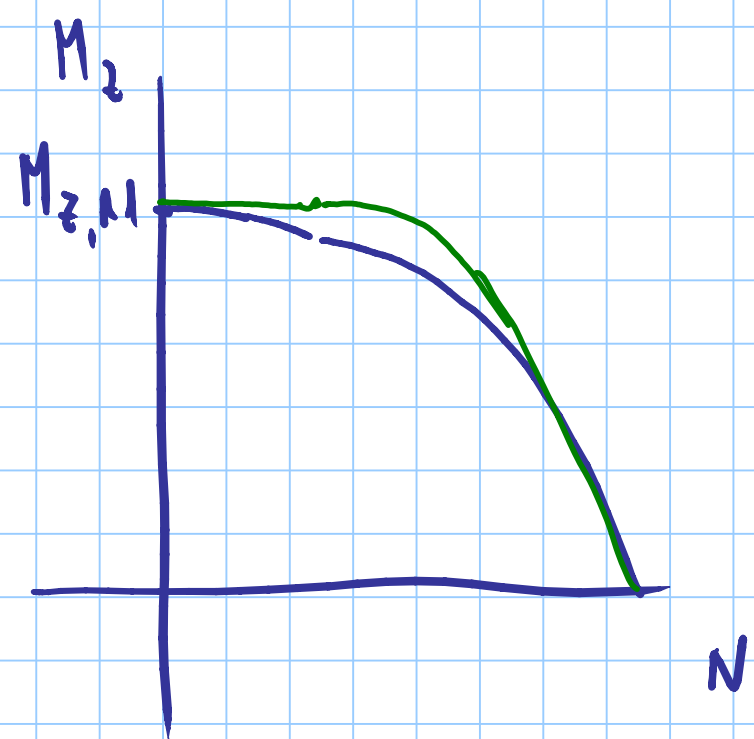
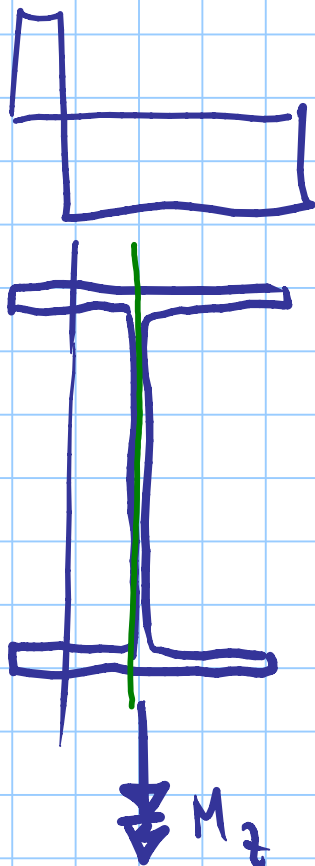
$$M_{Ed} = 1534 \times 10^3 \times \frac{355}{1.05} \times 10^{-6} = 518.6 \text{ kNm}$$

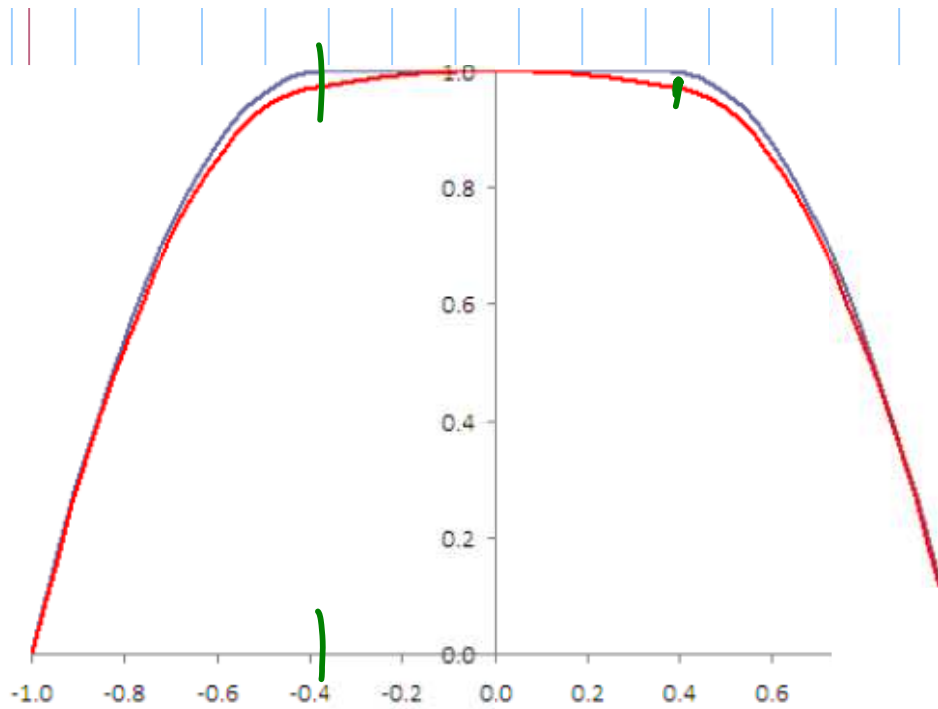
$$n = \frac{2300}{4443} = 0.518$$

$$M_{N,ed} = 518.6 \times \frac{1 - 0.518}{1 - 0.233/2} = 283 \text{ kNm} < M_{Ed}$$

occure HEB 300

$$A = 131.4 \times 10^2 \text{ mm}^2$$

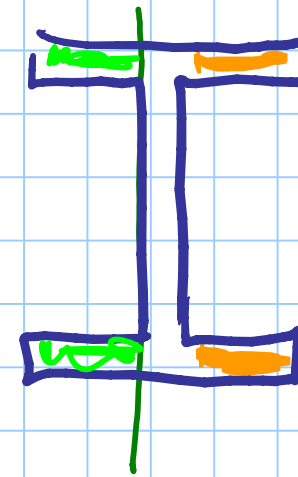




$a N_{Rd}$

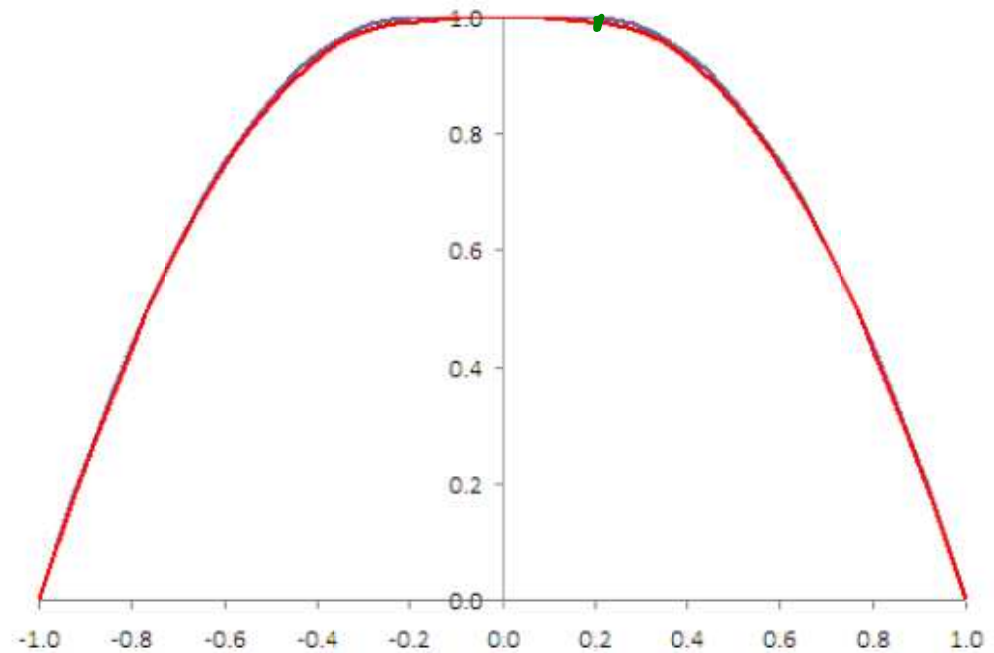
$$M_{N,Rd} = M_{Rd} \left[1 - \left(\frac{n-a}{1-a} \right)^2 \right]$$

per $N_{Ed} \geq a N_{Rd}$



$$N = A_{min} \frac{f_y}{\gamma_m}$$

$$= a N_{Rd}$$



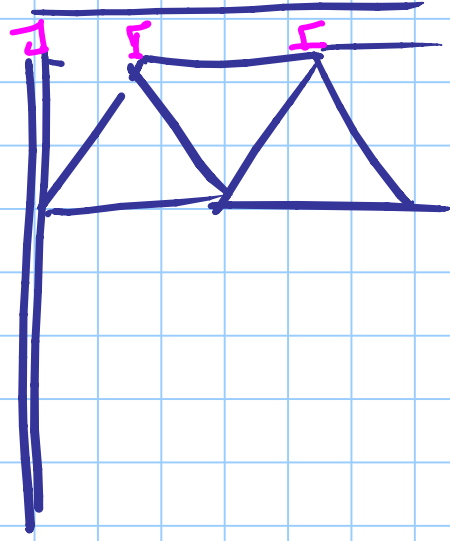
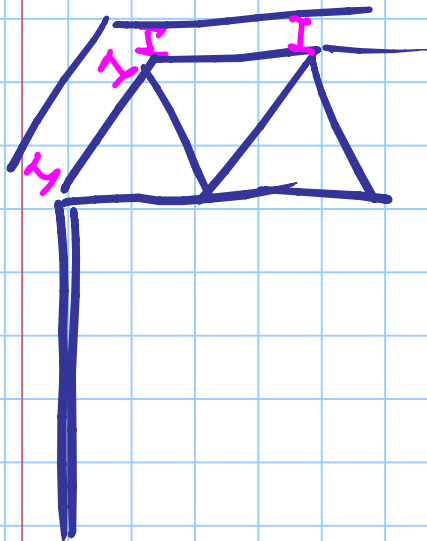
TENSO FLESSIONE DEVIATA

 N_{Ed} $M_{y,Ed}$ $M_{z,Ed}$ $M_{y,N,Rd}(N_{Ed})$ $M_{z,N,Rd}(N_{Ed})$

$$\eta = \frac{N_{Ed}}{N_{Rd}}$$

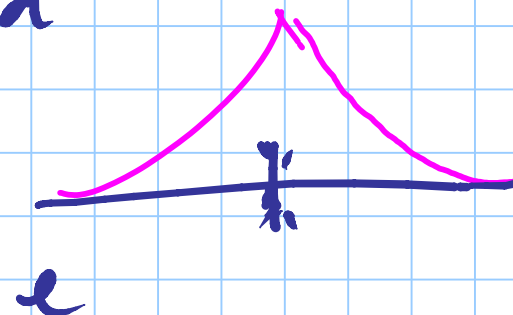
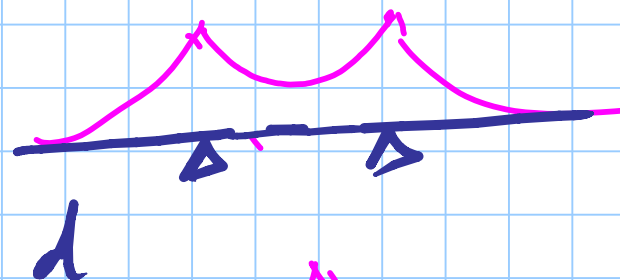
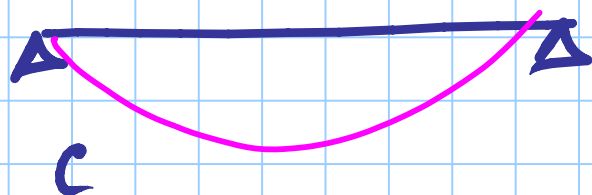
 $\max(1, \eta)$

$$\left(\frac{M_{y,Ed}}{M_{y,N,Rd}} \right)^2 + \left(\frac{M_{z,Ed}}{M_{z,N,Rd}} \right)^{\eta} \leq 1$$

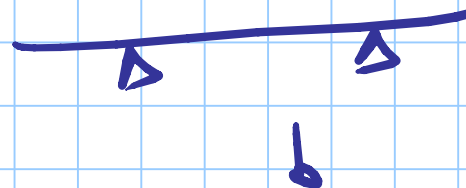
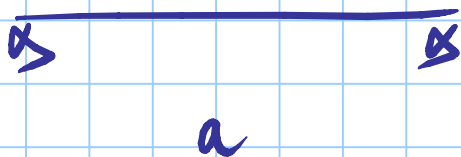


COPERTURA SCALE

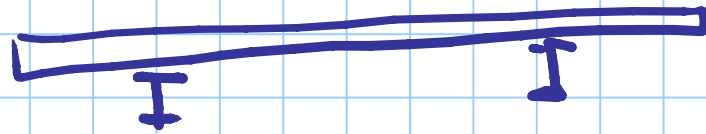
TRAV. PRINC.



TRAV. SEC.

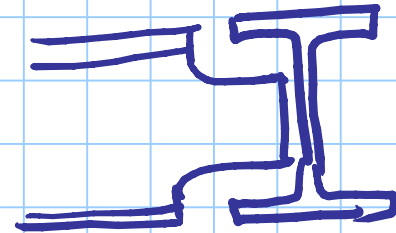
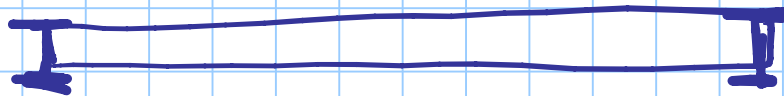


T_{max}
b



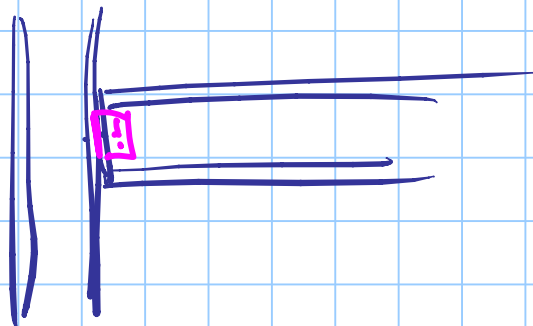
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Tr. princ.

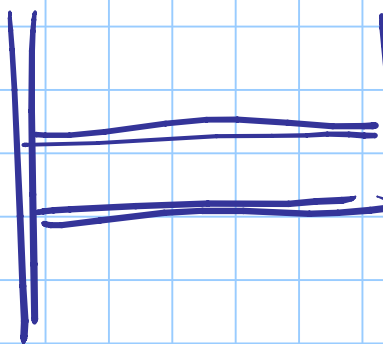
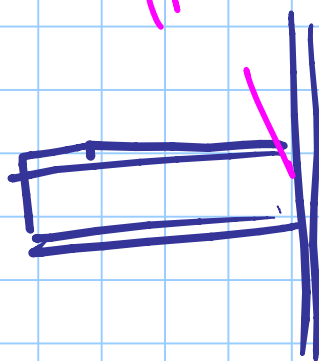
c



d

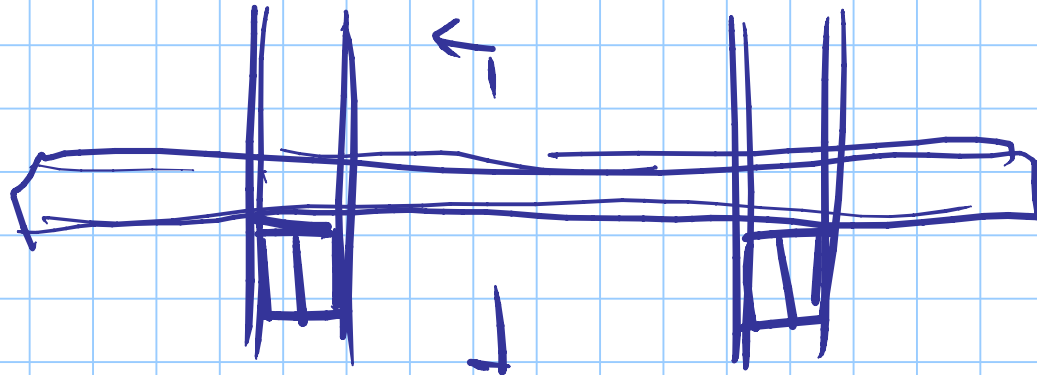
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INCASTRATO



INCASTRATO

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e



per la Tipologia e
trasmissione M