Titolo nota 11/12/2012

A - Gatt

Genova - Piazza F.

Piazza S - Zuccarello

D42 13.20

D43 13.41

D44 14.06

FLESSIONE COMPOSTA M, N

IN CAMPO ELASTICO

$$\sigma = \frac{N}{A} + \frac{M}{I} y$$

$$\sigma_{max} = \frac{N}{A} + \frac{M}{W} \leq \bar{\sigma}$$

T.A.

DOMINIO DI RESISTENZA

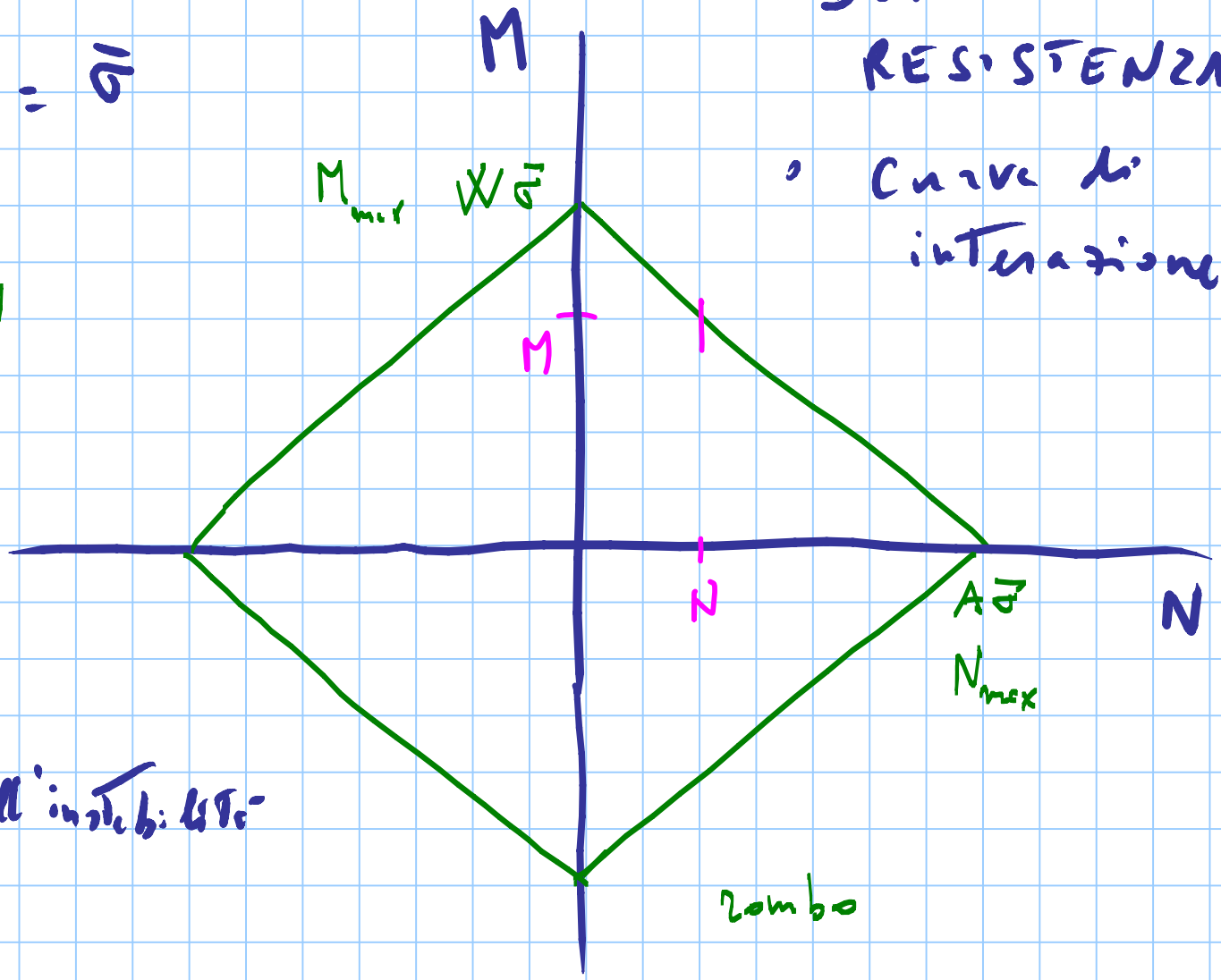
- Curve di interazione

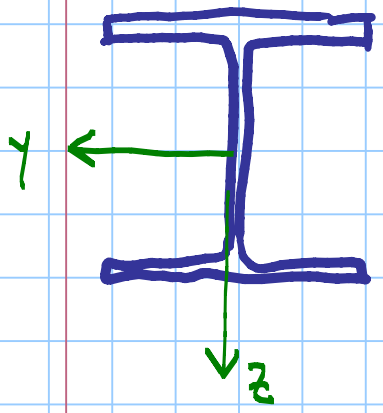
$$\frac{N}{A} + \frac{M}{W} = \sigma$$

$$\frac{N}{A\bar{\sigma}} + \frac{M}{W\bar{\sigma}} \geq 1$$

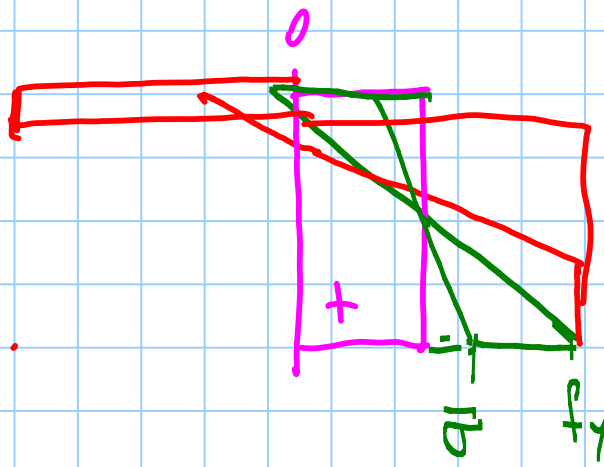
$$\frac{N}{N_{max}} + \frac{M}{M_{max}} \geq 1$$

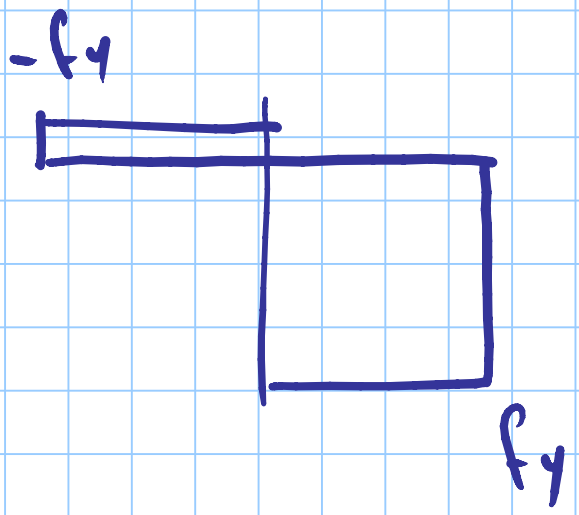
per le sezioni presoinflesse dell'instabilità





HEB





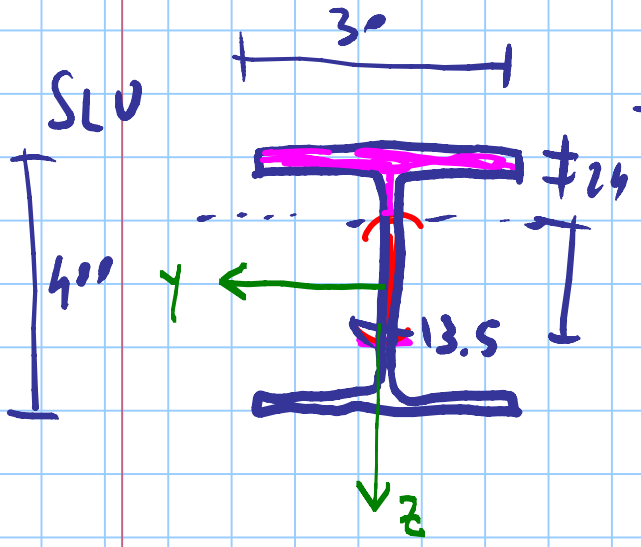
$\sigma = \frac{N}{A}$ $\sigma = \frac{M_y}{I} z$

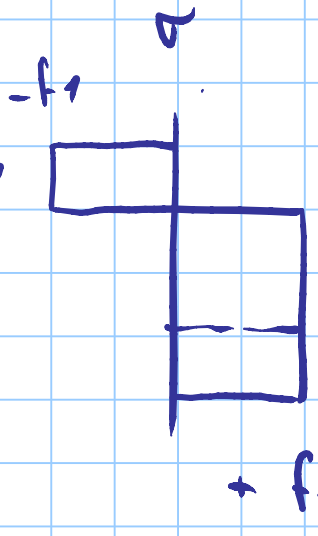
N

M

Nota: il processo di progressiva plasticizzazione è legato alla forma della sezione

SLU





HE 400 B COMPR TRAZ

dato $N_{Ed} > 0 \rightarrow M_{Rd}(N_{Ed})$

$M_{N,Rd}$

$$N = \int \sigma \, dA$$

S 235

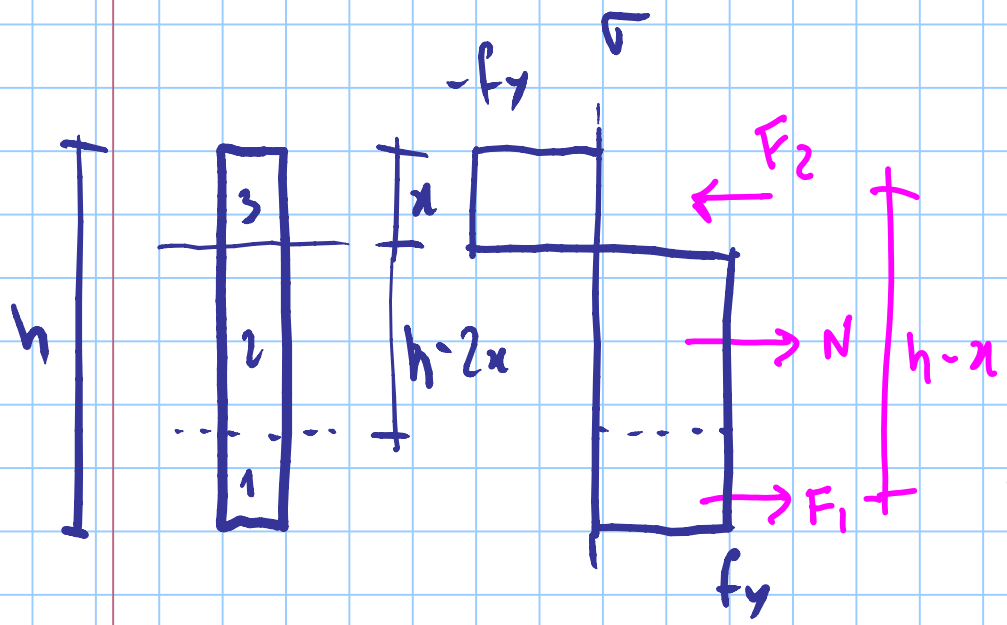
$$f_y \left(A_{Tm} - A_{compr} \right) = N_{Ed}$$

$N_{Ed} = 600$ KN

$$f_y (400 - 2x) t_w = N_{Ed}$$

$x = 100.7$

$$400 - 2x = \frac{N_{Ed}}{t_w f_y / \gamma_{M_0}} \Rightarrow x = \frac{1}{2}\left[400 - \frac{N_{Ed} \gamma_{M_0}}{t_w f_y} \right] = \frac{1}{2}\left[400 - 198.6 \right]$$



$$N_{Ed} = t\,(h-2x)\,\frac{f_y}{\gamma_{M0}}$$

t

$$F_1 = F_2 = t\,x\,\frac{f_y}{\gamma_{M0}}$$

$$M_{N,Rd} = t\,x\,(h-x)\,\frac{f_y}{\gamma_{M0}}$$

$$\frac{1}{2}\left[h - \frac{N_{Ed}\,\gamma_{M0}}{t\,f_y}\right] = x$$

sostituisco in $M_{N,Rd}$

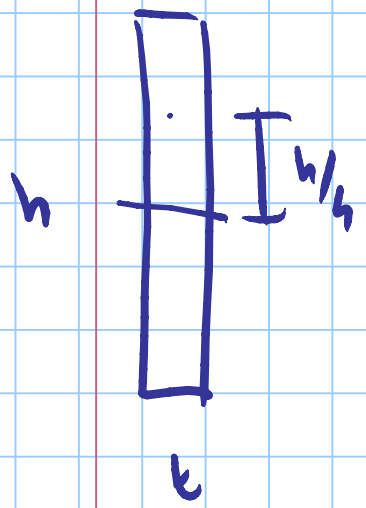
$$h - x = h - \frac{1}{2}\left[h - \frac{N_{Ed}\,\gamma_{M0}}{t\,f_y}\right] = \frac{1}{2}\left[h + \frac{N_{Ed}\,\gamma_{M0}}{t\,f_y}\right]$$

$$x = \frac{h}{2}\left[1 - \frac{N_{Ed}\,\gamma_{M0}}{t\,h\,f_y}\right] = \qquad h - x = \frac{h}{2}\left[1 + \frac{N_{Ed}\,\gamma_{M0}}{t\,h\,f_y}\right] =$$

$$= \frac{h}{2}\left[1 - \frac{N_{Ed}}{N_{Rd}}\right] \qquad = \frac{h}{2}\left[1 + \frac{N_{Ed}}{N_{Rd}}\right]$$

$$M_{N,Rd} = t\,\frac{h}{2}\left[1 - \frac{N_{Ed}}{N_{Rd}}\right]\frac{h}{2}\left[1 + \frac{N_{Ed}}{N_{Rd}}\right]\frac{f_y}{\gamma_{M0}}$$

$$M_{N,Rd} = \frac{t h^2}{4} \frac{f_y}{\gamma_{M0}} \left[1 - \left(\frac{N_{Ed}}{N_{Rd}} \right)^2 \right]$$

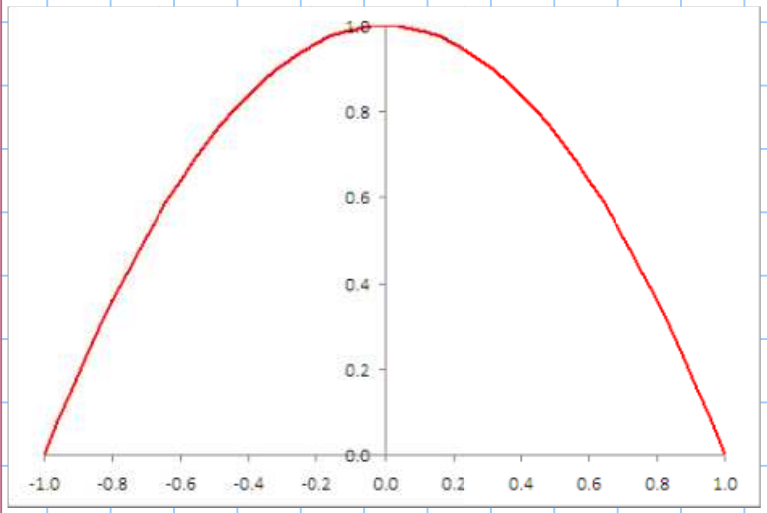


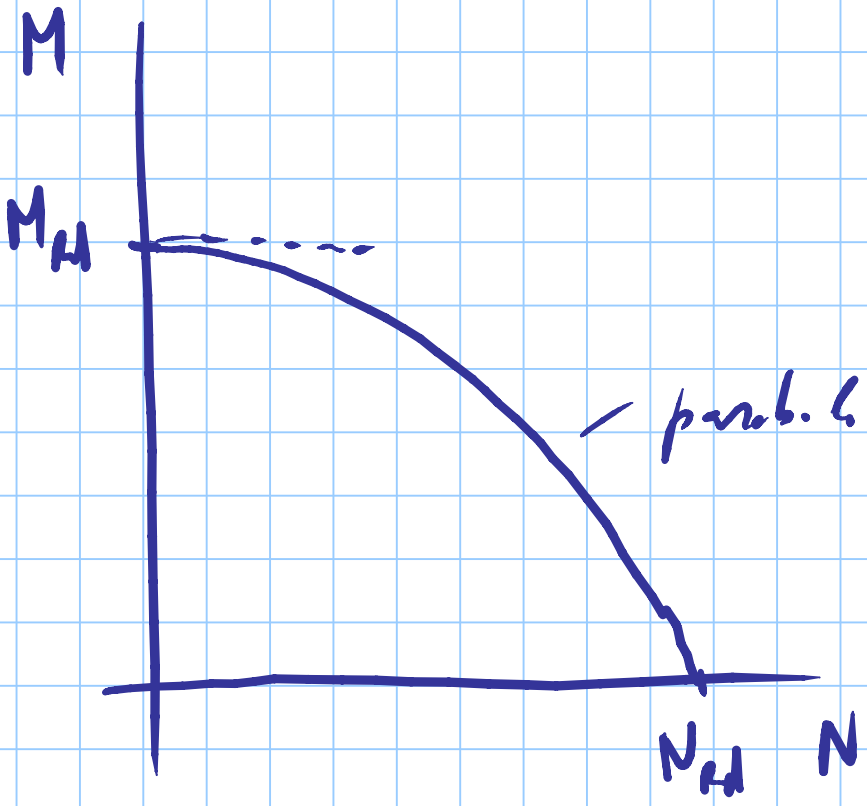
$$S_{1/2} = t \frac{h}{2} \cdot \frac{h}{4} = t \frac{h^2}{8}$$

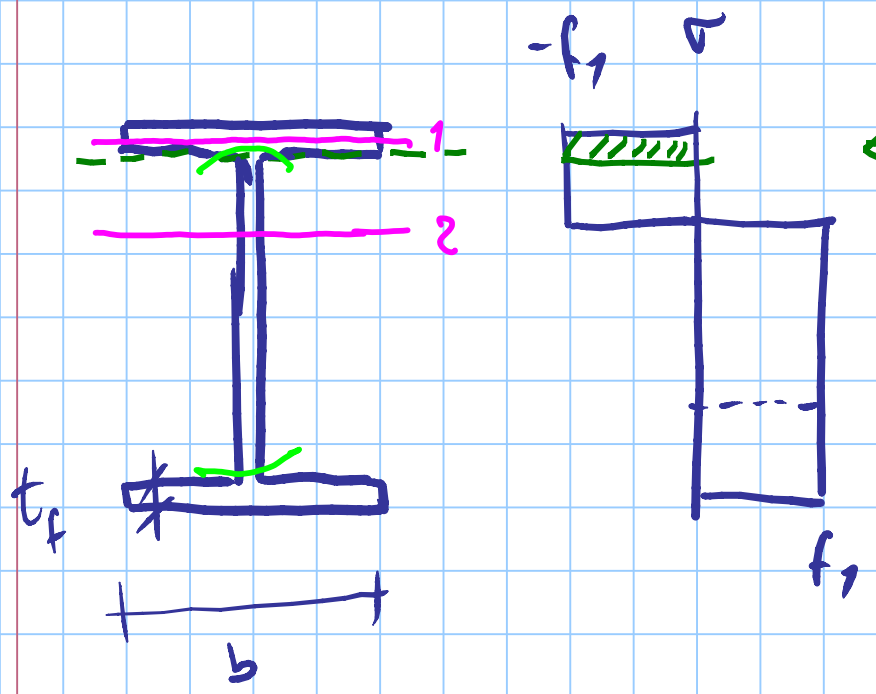
$$W_{pl} = 2 S_{1/2} = t \frac{h^2}{4}$$

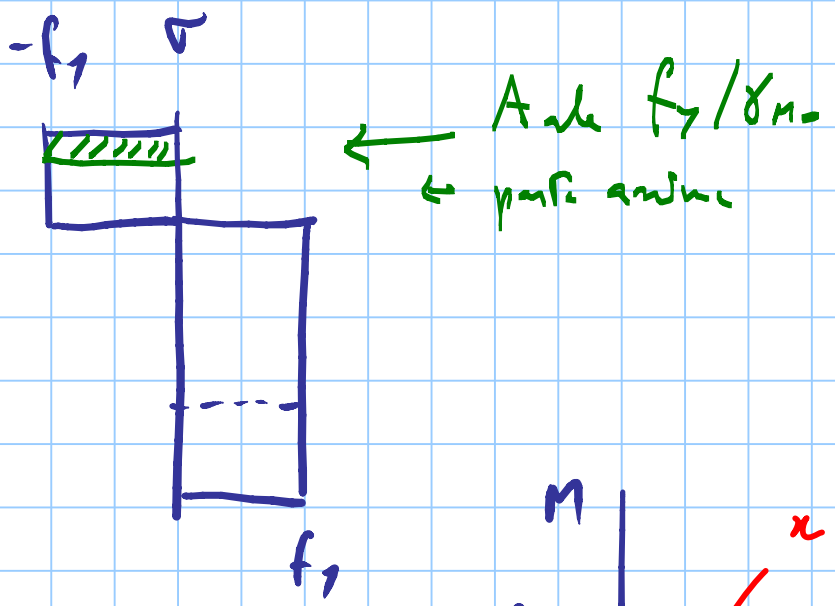
$$M_{N,Rd} = M_{Rd} \left[1 - \left(\frac{N_{Ed}}{N_{Rd}} \right)^2 \right]$$

$$\frac{M_{N,Rd}}{M_{Rd}} + \left(\frac{N_{Ed}}{N_{Rd}}\right)^2 = 1$$



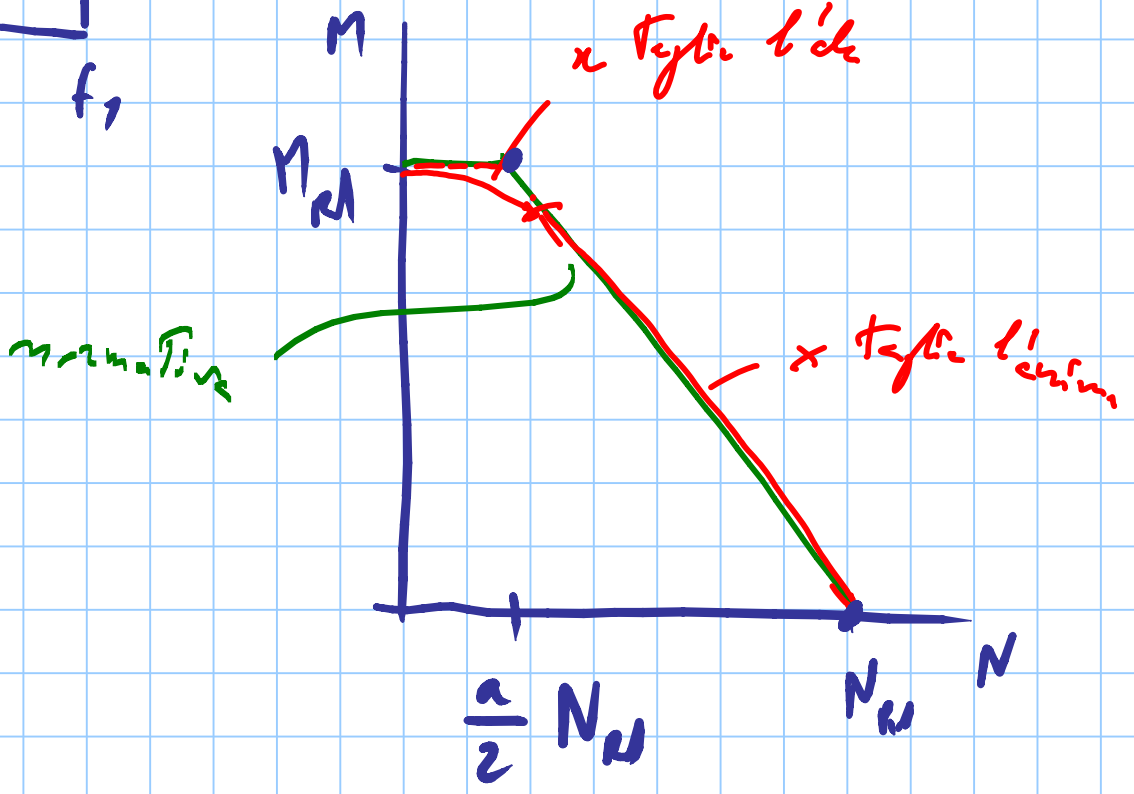






Area f_y/γ_{M0}

$$a = \frac{A - 2bt_f}{A}$$



μM_y

$\mu \quad N_{Ed} \leq \frac{a}{2} N_{Rd}$ $\qquad M_{N,Rd} = M_{Rd}$

$\mu \quad N_{Ed} > \frac{a}{2} N_{Rd}$ $\qquad M_{N,Rd} = M_{Rd} \frac{1 - N_{Ed}/N_{Rd}}{1 - 0.5a}$

Esempio HE 400 B

S275

$N_{Ed} = 420\ kN$

$M_{N,Rd} = ?$

$A = 197.8 \times 10^2\ mm^2$

$W_{pl,y} = 3232 \times 10^3\ mm^3$

$b = 300\ mm \quad t_f = 24\ mm$

$$a = \frac{197.8 \times 10^2 - 2 \times 300 \times 24}{197.8 \times 10^2} =$$

$$= 0.272$$

$$N_{Rd} = \frac{197.8 \times 10^2 \times 275}{1.05} \times 10^{-3} = 5180\ kN$$

$$M_{Rd} = \frac{3232 \times 10^3 \times 275}{1.05} \times 10^{-6} = 846\ kNm$$

$$\frac{a}{2} N_{Rd} = 704\ kN$$