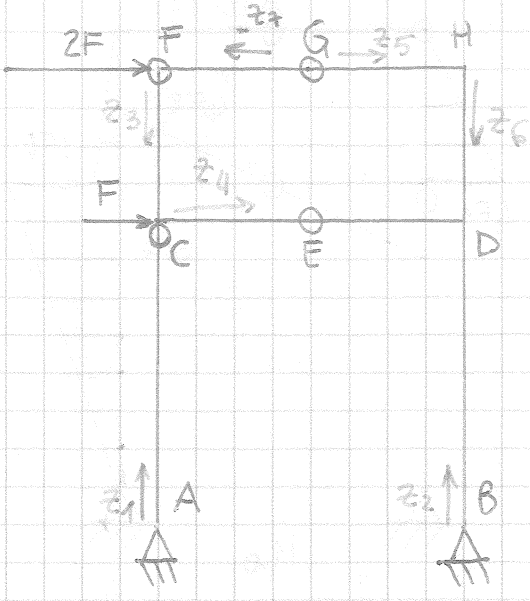
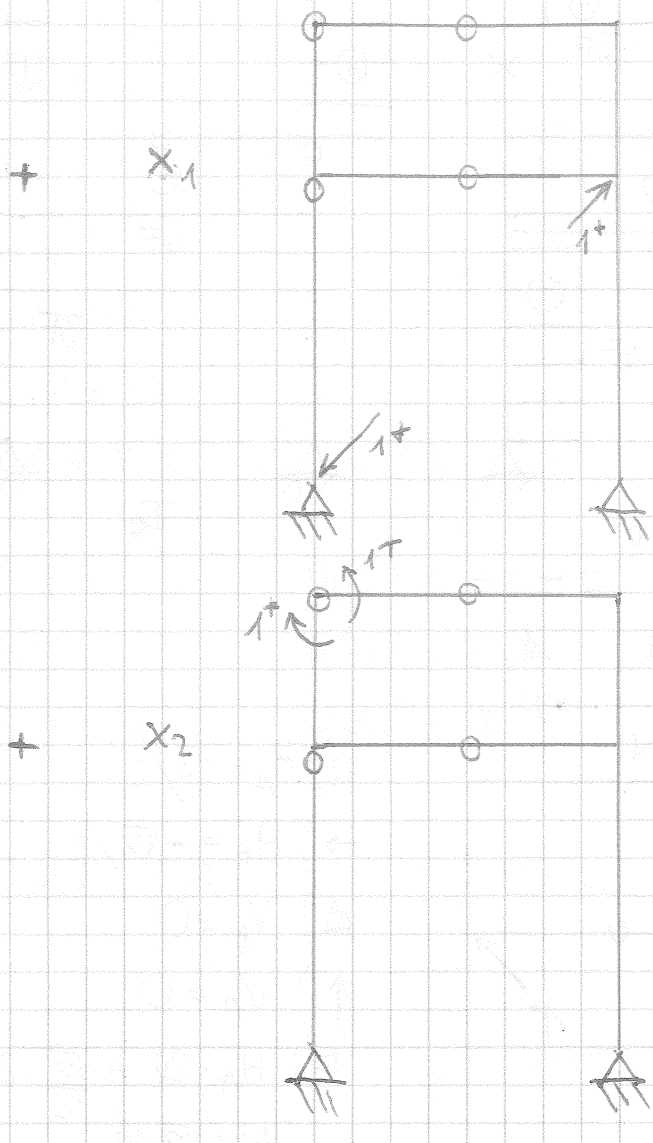
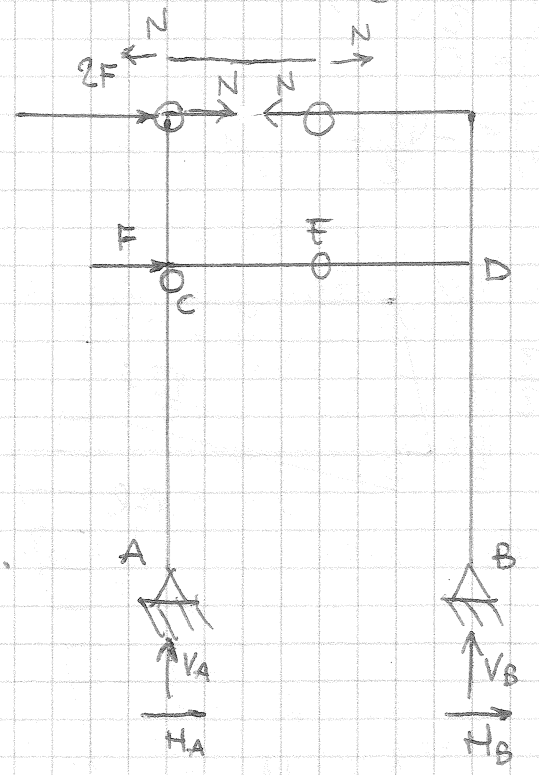
FILA A





SISTEMA O



$E)\ -N\cdot\ell - 2F\cdot\ell - V_A\cdot\ell = 0 \quad N = 2F$

$C)\ H_A = 0$

$\rightarrow)\ H_B = \cancel{0} - 3F$

$B)\ V_A\,2\ell + F\cdot 2\ell + 2F\cdot 3\ell = 0$

$V_A = -4F$

$\uparrow)\ V_A = -V_B \quad V_B = 4F$

$M(z_1) = 0$

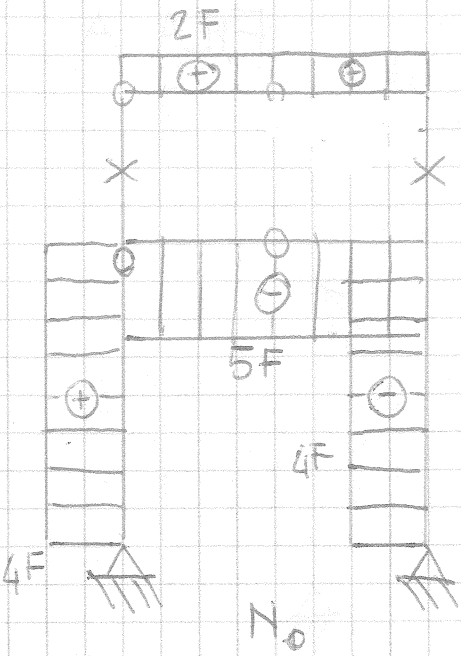
$M(z_2) = -3F z$

$M(z_3) = -4F z$

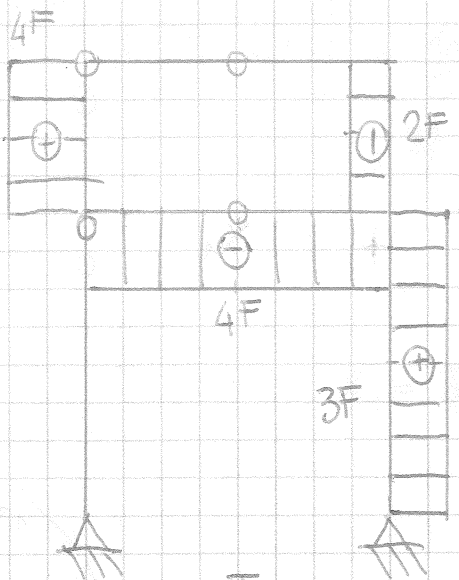
$M(z_4) = 4F\ell - 4F z$

$M(z_5) = 0$

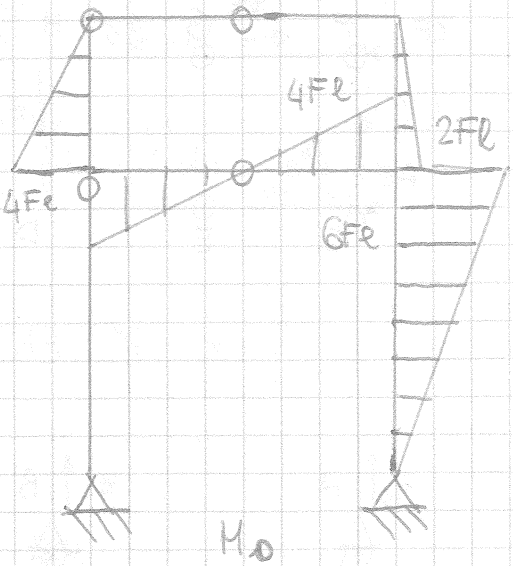
$M(z_6) = -2F z$



N_0

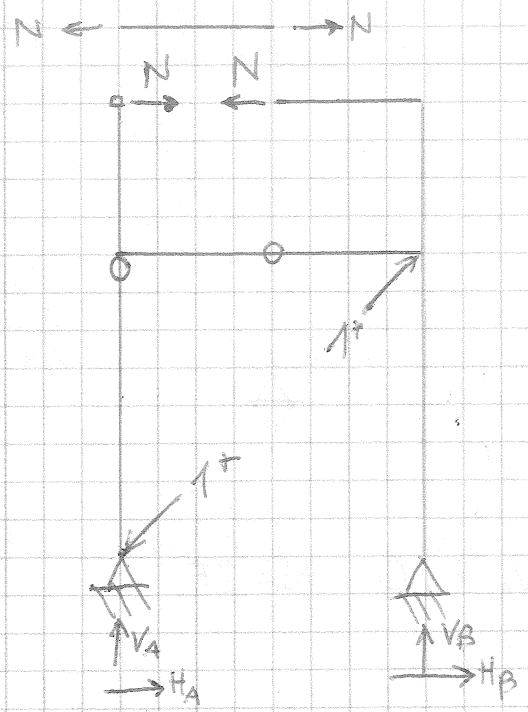


T_0



M_0

SISTEMA 1



c) $\uparrow H_A = \sqrt{2}/2$

$\rightarrow$) $H_B = -\sqrt{2}/2$

A) $V_B = 0$

$\uparrow$) $V_A = 0$

D) $H_A \cdot 2\ell - \frac{\sqrt{2}}{2} \cdot 2\ell + \frac{\sqrt{2}}{2}\ell - N \cdot \ell = 0$

$N = \sqrt{2}/2$

$M(z_1) = 0$

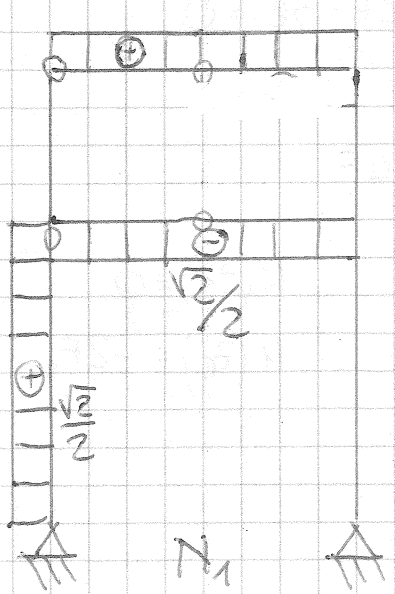
$M(z_2) = -\frac{\sqrt{2}}{2} z$

$M(z_3) = -\frac{\sqrt{2}}{2} z$

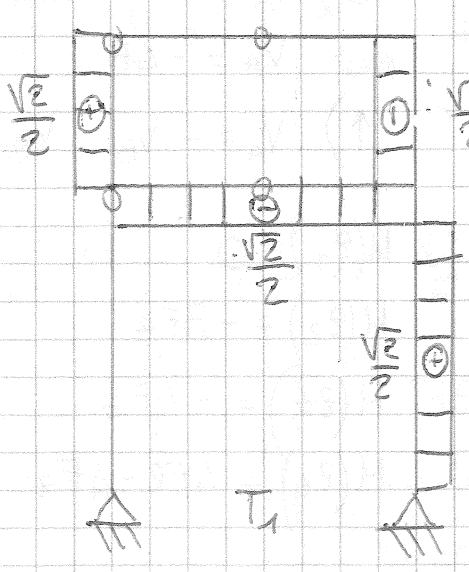
$M(z_4) = \frac{\sqrt{2}}{2}(\ell - z)$

$M(z_5) = 0$

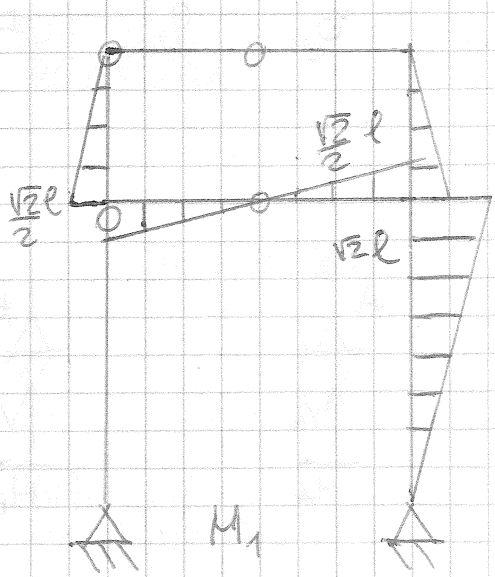
$M(z_6) = -\frac{\sqrt{2}}{2} z$



N_1

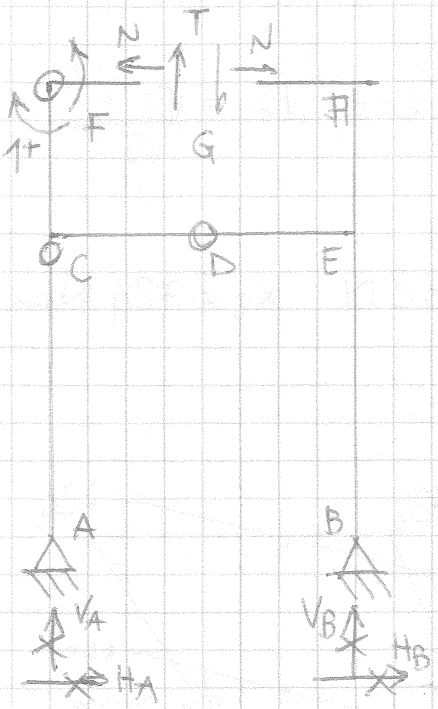


T_1



M_1

SISTEMA 2



C) $H_A = 0$

→) $H_B = 0$

C) $V_B = 0$

↑) $V_A = 0$

G) $N = 0$

F) $1 + T \cdot \ell = 0 \qquad T = -1/\ell$

$M(z_1) = 0$

$M(z_2) = 0$

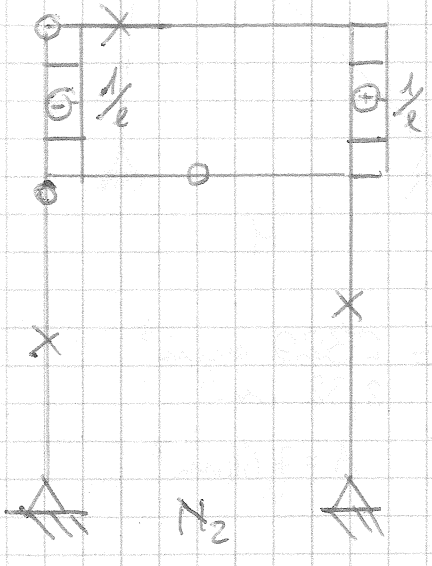
$M(z_3) = -1$

$M(z_4) = +1 + \frac{z}{\ell}$

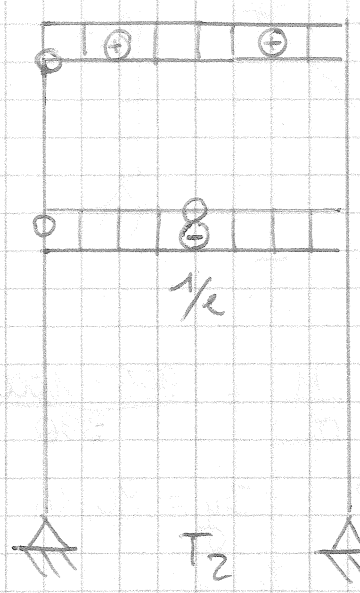
$M(z_5) = z/\ell$

$M(z_6) = 1$

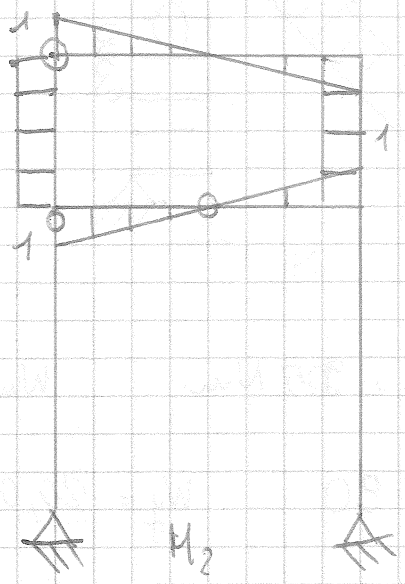
$M(z_7) = -\frac{z}{\ell}$



N_2



T_2



M_2

$$M_{10} = \frac{1}{EJ}\left[\int_0^{\ell}(-4Fz)\left(-\frac{\sqrt{2}}{2}z\right)dz + \int_0^{2\ell}(-3Fz)\left(-\frac{\sqrt{2}}{2}z\right)dz + \int_0^{2\ell} 4F\cdot\frac{\sqrt{2}}{2}\cdot(\ell-z)^2 dz + \right.$$
$$\left. + \int_0^{\ell}(-2Fz)\left(-\frac{\sqrt{2}}{2}z\right)dz\right] = \frac{5\sqrt{2}F\ell^3}{EJ}$$

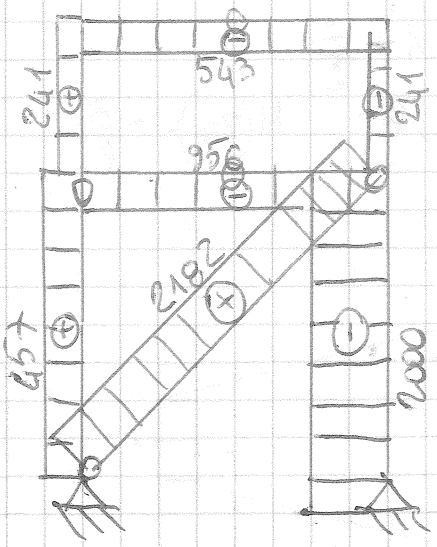
$$M_{20} = \frac{1}{EJ}\left[\int_0^{\ell}(-4Fz)(-1)\,dz \int_0^{2\ell}\left(4F(\ell-z)\right)\left(1-\frac{z}{\ell}\right)dz + \int_0^{\ell}(-2Fz)(1)\,dz\right.$$
$$= \frac{11F\ell^2}{EJ}$$

$$M_{11} = \frac{1}{EJ}\left[\int_0^{2\ell}\left(\frac{z^2}{2}\right)dz + 2\int_0^{\ell}\frac{z^2}{2}dz + \int_0^{2\ell}\frac{1}{2}(\ell-z)^2 dz = \frac{2\ell^3}{EJ}\right.$$

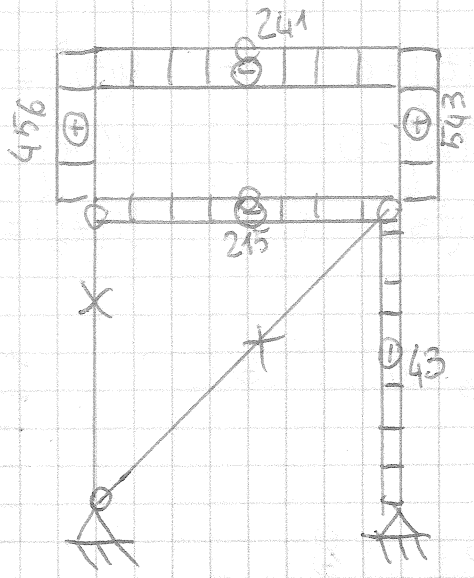
$$\eta_{22} = \frac{1}{EJ}\left[2\int_0^{\ell} 1\,dz + 2\int_0^{2\ell} \frac{(\ell - z)^2}{\ell^2}\,dz\right] = \frac{10\ell}{3EJ}$$

$$\eta_{12} = \frac{1}{EJ}\left[\int_0^{\ell} \left(\frac{\sqrt{2}}{2}z\right)dz + \int_0^{\ell}\left(-\frac{\sqrt{2}}{2}z\right)dz + \int_0^{2\ell} \frac{\sqrt{2}}{2\ell}(\ell - z)^2\,dz\right] = \frac{\sqrt{2}\,\ell^2}{3EJ}$$

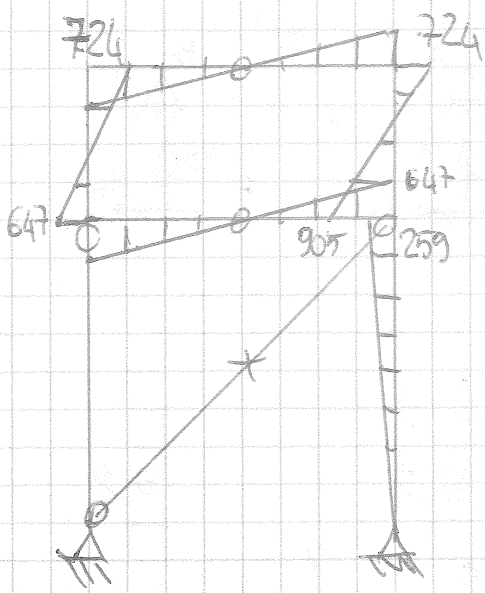
$$\begin{cases} \eta_{11}\cdot X_1 + \eta_{12}\cdot X_2 = -\eta_{10} \\ \eta_{12}\cdot X_1 + \eta_{22}\cdot X_2 = -\eta_{20} \end{cases} \qquad X_1 = -2182\ N \qquad X_2 = 724\ Nm$$



N



T



M

$M_{max} = 905\ Nm$ $\qquad W_{min} = \frac{M}{\sigma_{am}} = \frac{905 \cdot 1000}{390} = 2329\ mm^3 = 2{,}32\ cm^3$

IPE 80 $\qquad W_y = 20{,}03\ cm^3 \qquad I_y = 80{,}14\ cm^4 \qquad A = 7{,}64\ mm^2$

VERIFICA

$N = 241\ N$

$M = 905\ Nm$

$$\sigma = \frac{N}{A} + \frac{M}{W} = \frac{241}{7{,}64 \cdot 100} + \frac{905 \cdot 1000}{20{,}03 \cdot 1000} = 46 < 390\ ok$$

$$\eta_{11}^{N} = \frac{2\ell^3}{EJ} + \int_0^{\sqrt{2}\ell} \frac{1^2}{EA}\,dz = \frac{2\ell^3}{EJ} + \frac{\sqrt{2}\,\ell}{EA_6} \qquad A_1 = 14 \cdot 2000^2$$

$$\begin{cases} \eta_{11}^{N}\cdot X_1 + \eta_{12}\cdot X_2 = -\eta_{10} \\ \eta_{12}\cdot X_1 + \eta_{22}\cdot X_2 = -\eta_{20} \end{cases} \qquad X_1 = -2182\ N \qquad X_2 = -724\ Nm$$

Tener conto della def assiale varia la risposta strutturale