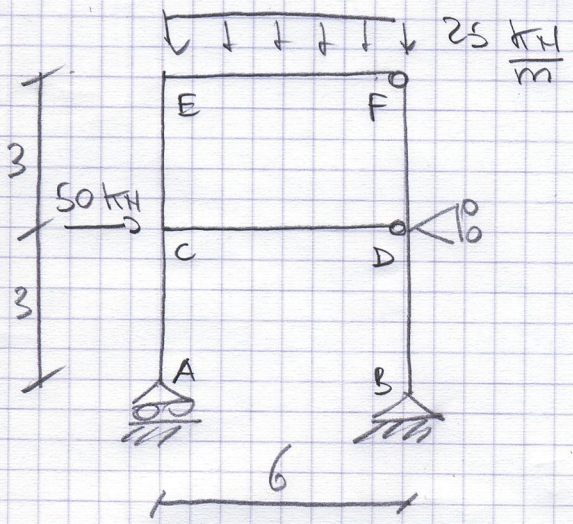
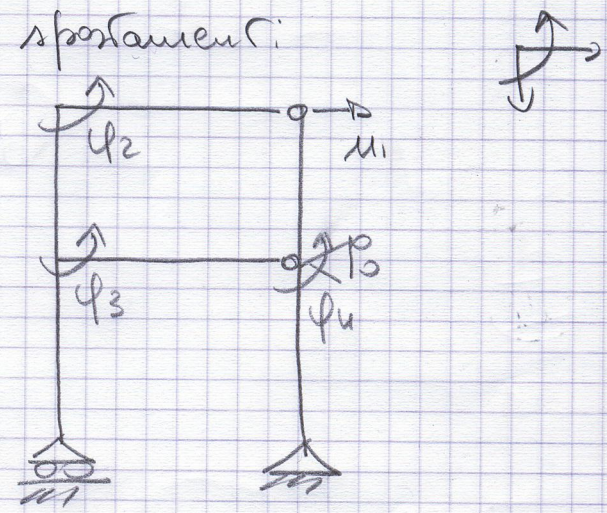
20-06-2011

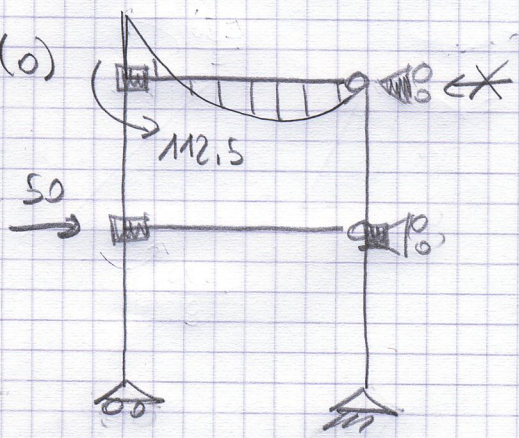
FILA (A)



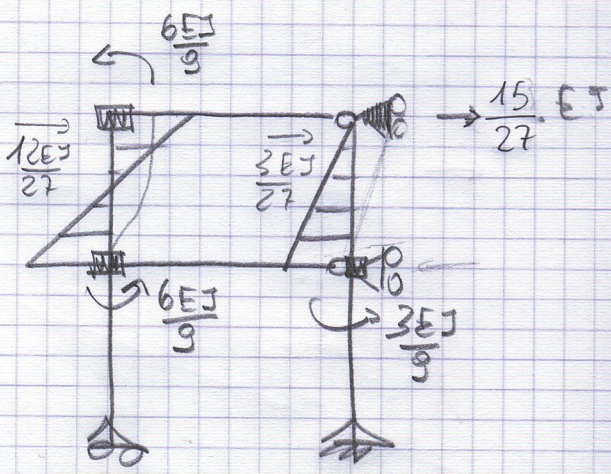
4 sprostavenje:



(0)

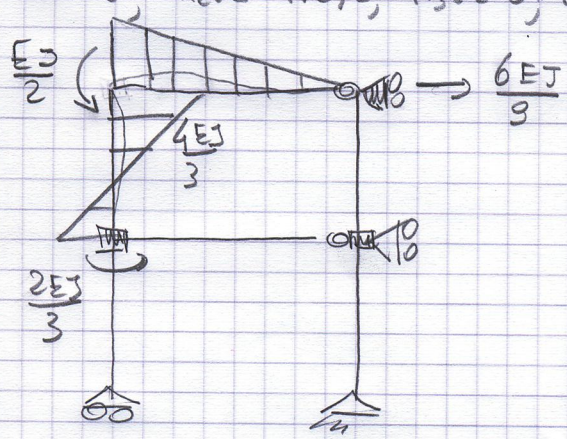


(1)

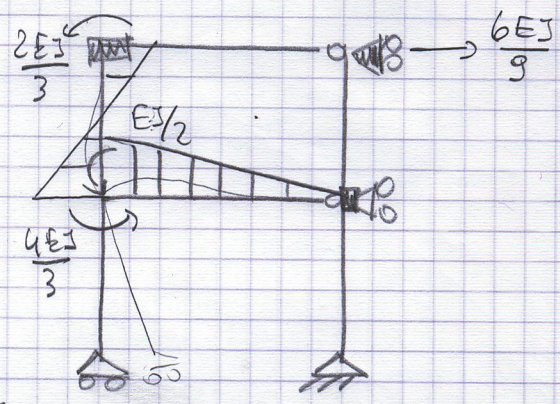


$k_{10} = 0 \cdot k_{20} = 112{,}5; k_{30} = 0; k_{40} = 0$ $k_{11} = \frac{15EJ}{27}$ $k_{12} = \frac{6EJ}{9}; k_{13} = \frac{6EJ}{9}; k_{14} = \frac{3EJ}{9}$

(2)

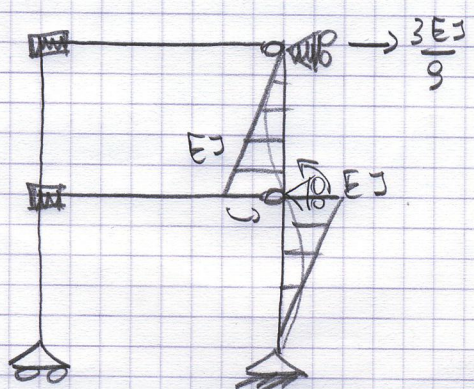


(3)



$k_{21} = \frac{6EJ}{9}; k_{22} = \frac{11EJ}{6}; k_{23} = \frac{2EJ}{3}; k_{24} = 0$ $k_{31} = \frac{6EJ}{9}; k_{32} = \frac{2EJ}{3}; k_{33} = \frac{11EJ}{6}; k_{34} = 0$

(4)



$k_{41} = \frac{3EJ}{9}; k_{42} = 0$

$k_{43} = 0; k_{44} = 2EJ$

II

$$EJ\begin{pmatrix} 15/27 & 6/9 & 6/9 & 3/9 \\ 6/9 & 11/6 & 2/3 & 0 \\ 6/9 & 2/3 & 11/6 & 0 \\ 3/9 & 0 & 0 & 2 \end{pmatrix}\begin{pmatrix} \varphi_1 \\ \varphi_2 \\ \varphi_3 \\ \varphi_4 \end{pmatrix} = \begin{pmatrix} 0 \\ -112,5 \\ 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} \varphi_1 \\ \varphi_2 \\ \varphi_3 \\ \varphi_4 \end{pmatrix} = \frac{1}{EJ}\begin{pmatrix} 207,69 \\ -126,10 \\ -29,67 \\ -34,62 \end{pmatrix}$$

$$M_{EF} = -112,5 - \frac{1}{2}(-126,10) = -49,45$$

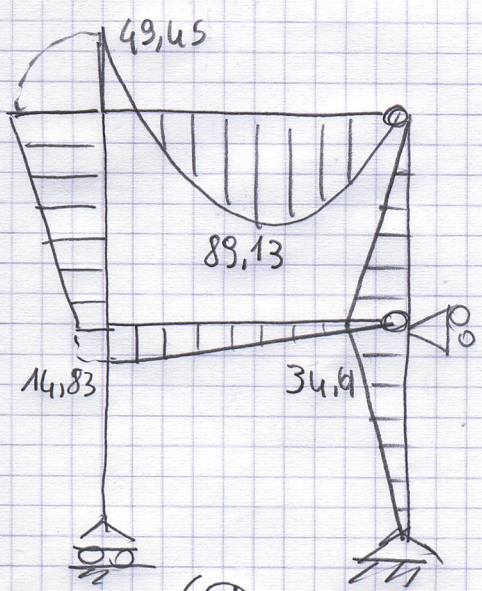
$$M_{EC} = \frac{4}{3}\cdot(-126,10) + \frac{2}{3}(-29,67) + \frac{6}{9}(207,69) = -49,45$$

$$M_{EC} = -\frac{1}{2}\cdot(-29,67) = 14,83$$

$$M_{CE} = -\frac{6}{9}(207,69) - \frac{2}{3}(-126,10) - \frac{4}{3}(-29,67) = -14,83$$

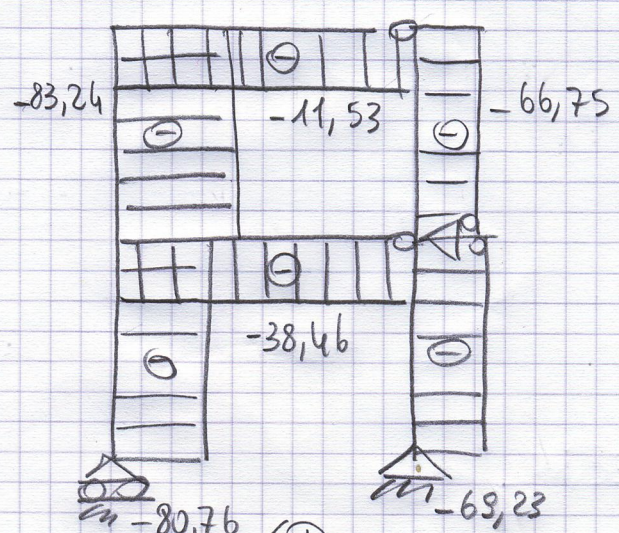
$$M_{DF} = -\frac{3}{9}(207,69) + 34,62 = -34,61$$

$$M_{DB} = -34,62$$



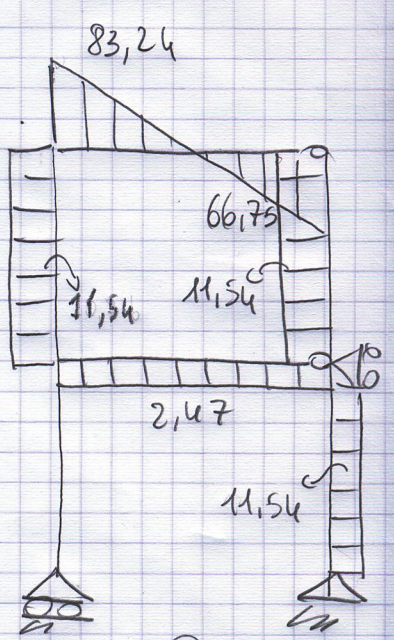
(M)

[kN.m]



(N)

[kN]



(T)

[kN]

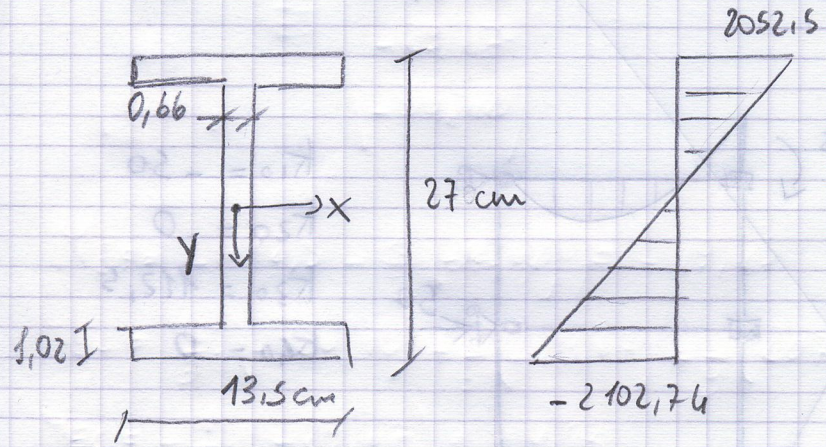
Progetto

$M_{max} = 89{,}13$ kN.m $T = 0$

$N = -11{,}53$ kN

$$W_{min} = \frac{8913.100}{2600} = 342{,}81 \text{ cm}^3 \Rightarrow \text{IPE } 270 \quad W_x = 429 \text{ cm}^3$$

Verifica



$$\sigma = \frac{N}{A} \pm \frac{M}{W_x} = -\frac{1153}{45{,}8} \pm \frac{8913.100}{429}$$

$\nearrow$ 2052,5 kg/cm²

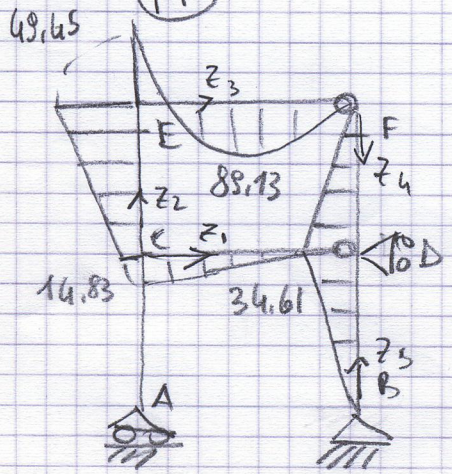
$\searrow$ -2102,74 "

Entrambi risultano minori di 2600 kg/cm² $\Rightarrow$ verificato

Punto D

Calcolo di μ_A

(M)



$M_{CD}(z_1) = -2,47 \cdot z_1 + 14,83$

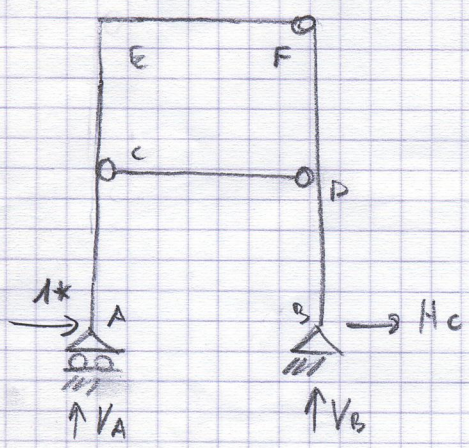
$M_{CE}(z_2) = -11,54 \cdot z_2 - 14,83$

$M_{EF}(z_3) = 83,24 \cdot z_3 - 69,45 - 12,5 \cdot z_3^2$

$M_{FD}(z_4) = -11,54 \cdot z_4$

$M_{BD}(z_5) = -11,54 \cdot z_5$

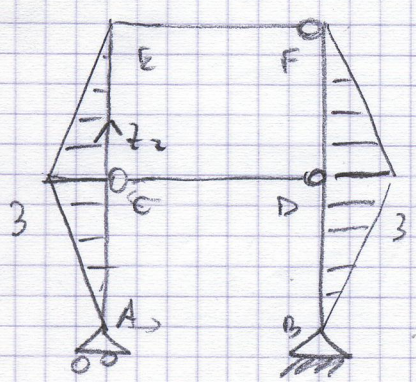
Isostatico equivalente:



$\uparrow) \; V_A + V_B = 0 \Rightarrow V_A = -V_B$

$\rightarrow) \; 1 + H_C = 0 \Rightarrow H_C = -1$

$A\circlearrowleft \; V_B \cdot 6 = 0 \Rightarrow V_B = V_A = 0$



$M_{CD} = 0$

$M_{CE}(z_2) = -3 + z_2$

$M_{EF} = 0$

$M_{FD}(z_A) = +z_4$

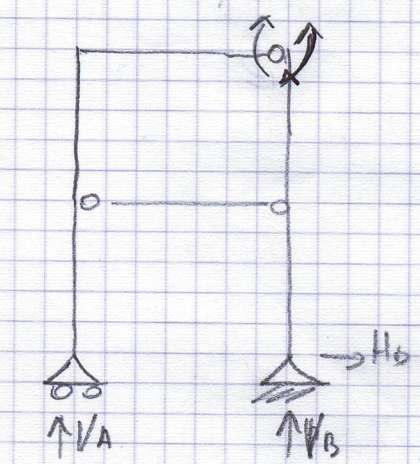
$M_{BD}(z_5) = z_5$

$$1^*.\ \mu_A = \frac{1}{EJ}\int_0^3 (-11,54 \cdot z_2 - 14,83)\cdot(-3+z_2)\,dz + \frac{1}{EJ}\int_0^3 (-11,54 \cdot z_4)\cdot z_4\,dz +$$

$$+\frac{1}{EJ}\int_0^3 (-11,54 \cdot z_5)\cdot z_5\,dz = \frac{1}{EJ}(118,65 - 103,86 - 103,86) = -\frac{89,07}{EJ}$$

$$1^x.\ u_A = \frac{-88,07}{EJ} = \frac{-88,07}{210.10^6 . 5790.10^{-8}} = -0,0073\ m$$

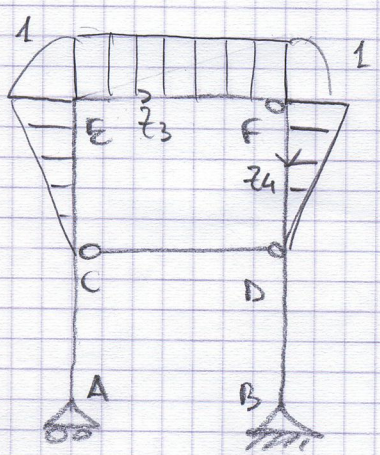
Rotazione relativa della cerniera F



$\uparrow) V_A + V_B = 0$

$A\rceil) V_B . 6 = 0 \Rightarrow V_B = V_A = 0$

$\rightarrow) H_A = 0$



$M_{CE}(z_2) = -z/3$

$M_{EF}(z_3) = -1$

$M_{FD}(z_4) = 1 - z/3$

$$1.\ \varphi_F = \frac{1}{EJ}\left(\int_0^6 (83,24 . z - 49,45 - 12,5 . z^2)(-1)\,dz + \int_0^3 (-11,54 . z - 14,83) \cdot \left(-\frac{z}{3}\right)dz + \int_0^3 (-11,54 . z)\left(1 - z/3\right)dz\right)$$

$$\varphi_F = \frac{1}{EJ}\left(-301,62 + 56,865 - 17,31\right) = -\frac{262,065}{210.10^6 . 5790.10^{-8}}$$

$$= -0,0215$$