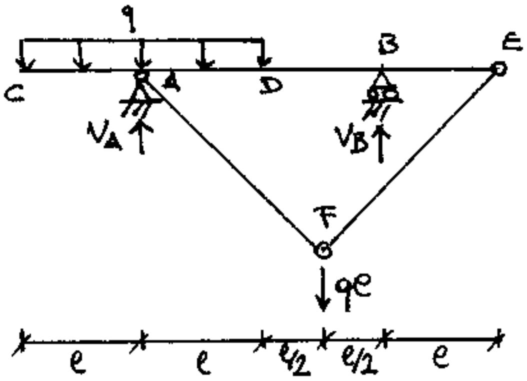
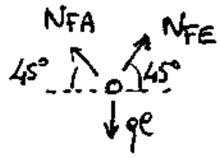
Esercizio 1. 06/09/02



$A \circlearrowleft \quad V_B\, 2\ell - q\ell \frac{3}{2}\ell = 0 \longrightarrow V_B = \frac{3}{4} q\ell = 1500 \text{ kg}$

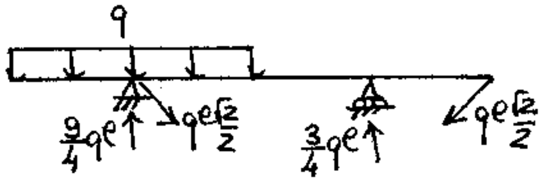
$V_A = 2q\ell + q\ell - \frac{3}{4} q\ell = \frac{9}{4} q\ell = 4500 \text{ kg}$

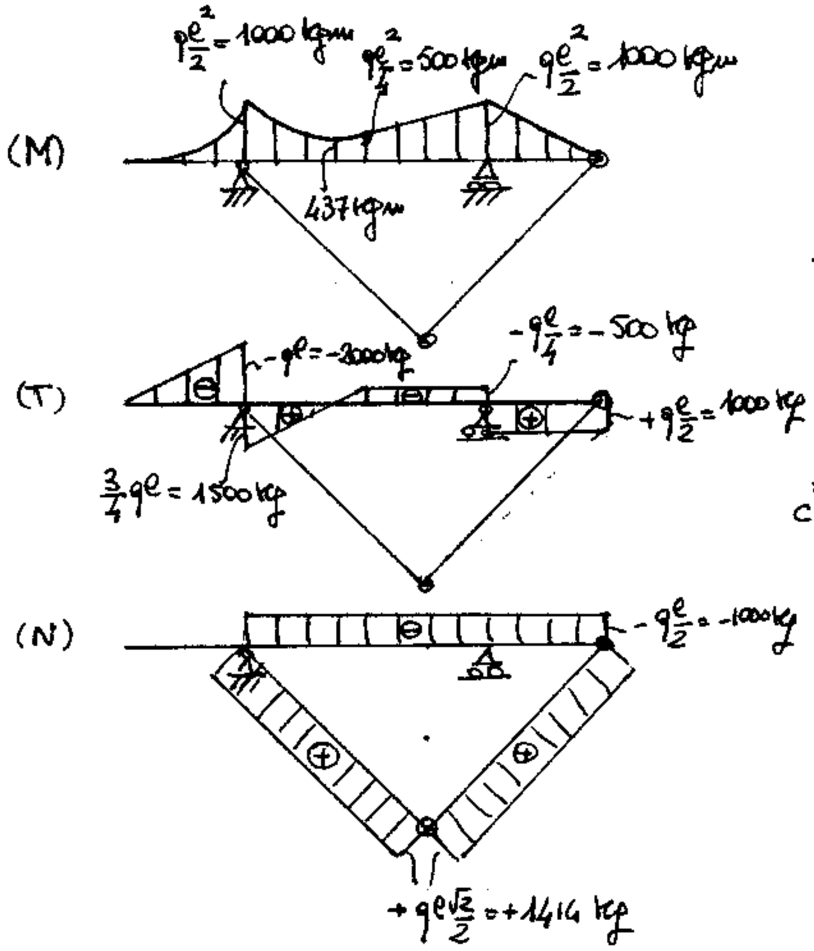
Equilibrio del nodo F:



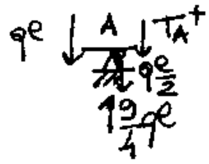
$$\begin{cases} \frac{\sqrt{2}}{2} N_{FA} = N_{FE} \frac{\sqrt{2}}{2} \\ 2 N_{FA} \frac{\sqrt{2}}{2} = q\ell \end{cases}$$

$\hookrightarrow N_{FA} = N_{FE} = q\ell \frac{\sqrt{2}}{2} = 1414 \text{ kg}$

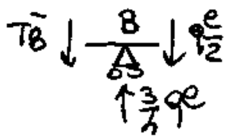




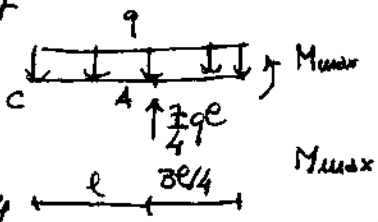
Calcoli



$T_A^+ = \left(\frac{9}{4} - \frac{3}{2}\right) q\ell = \frac{3}{4} q\ell$



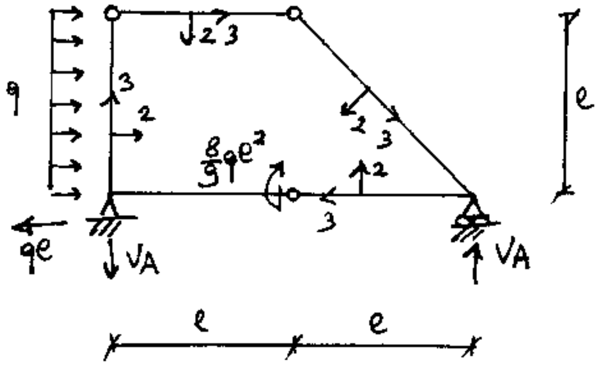
$T_B^- = q\frac{\ell}{4}$



$M_{max} = -\frac{7}{4} q\ell \frac{7}{8}\ell + \frac{3}{4} q\ell \frac{3}{4}\ell$

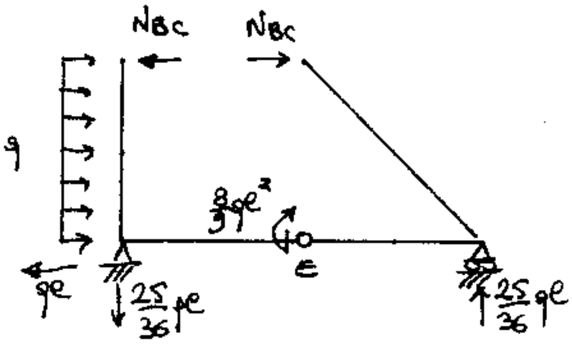
$= -\frac{7}{32} q\ell^2 = 437 \text{ kgm}$

Esercizio 2 06/09/02



$A \circlearrowleft \quad V_A \cdot 2e - \frac{8}{9} q e^2 - q\frac{e^2}{2} = 0$

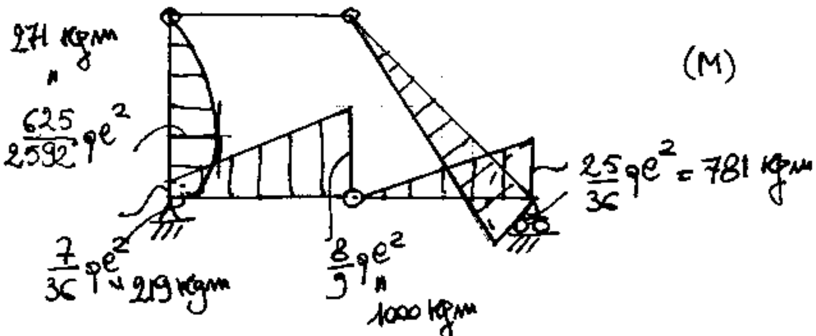
$\hookrightarrow V_A = \frac{25}{36} q e = 521\ kg$



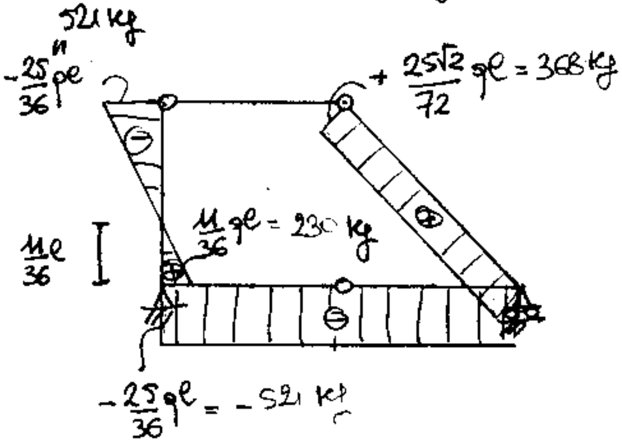
$E \circlearrowleft \quad - N_{BC}\, e + \frac{25}{36} q e^2 = 0$

$\hookrightarrow N_{BC} = \frac{25}{36} q e$ (compressione) $= 521\ kg$

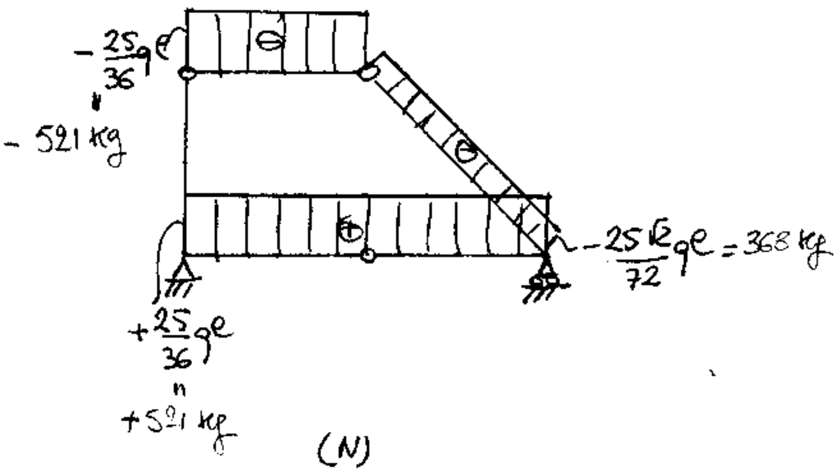
Diagrammi quotati :



(M)



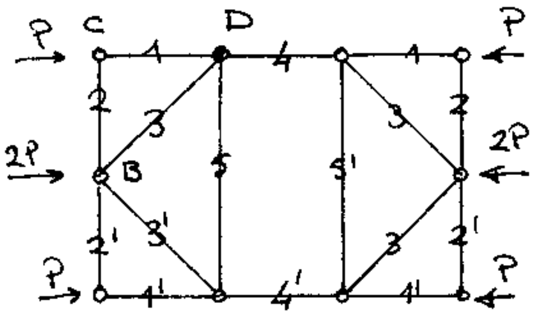
(T)



(N)

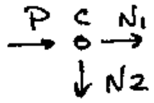
Esercizio 3 06/09/02

Stato di sollecitazione primario:



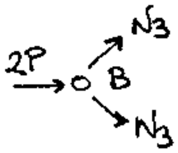
$P = q\ell/2 = 375\ \text{kg}$

La struttura ha due assi di simmetria. È quindi sufficiente considerare l'equilibrio dei soli nodi C, B e D. Per simmetria si ha poi che $N_2' = N_2$, etc.



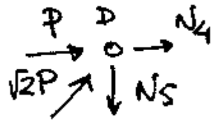
$N_1 = -P = -375\ \text{kg}$ (puntone)

$N_2 = 0$



$\cancel{2} N_3 \frac{\sqrt{2}}{2} = -\cancel{2}P$

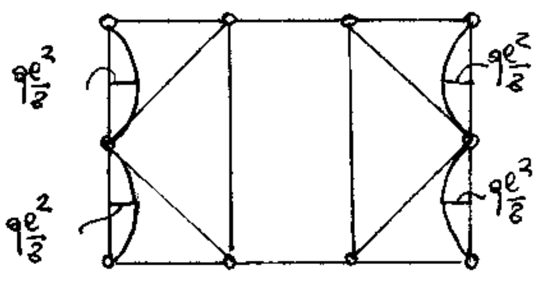
$\rightarrow N_3 = -\sqrt{2}P$
$= -530\ \text{kg}$ (puntone)



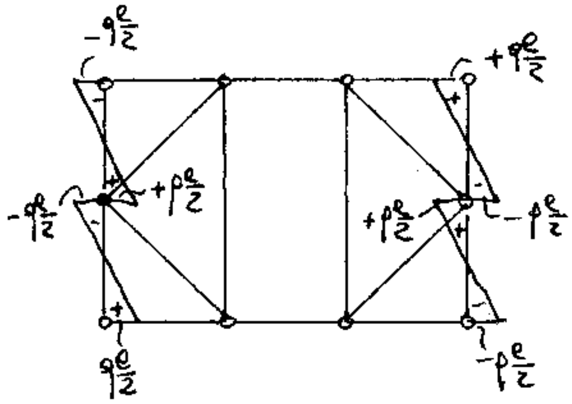
$N_5 = \cancel{\sqrt{2}}P \frac{\cancel{\sqrt{2}}}{\cancel{2}} = P = 375\ \text{kg}$ (tirante)

$N_4 = -P - \sqrt{2}P\frac{\sqrt{2}}{2} = -2P$
$= -750\ \text{kg}$

Stato di sollecitazione secondario:

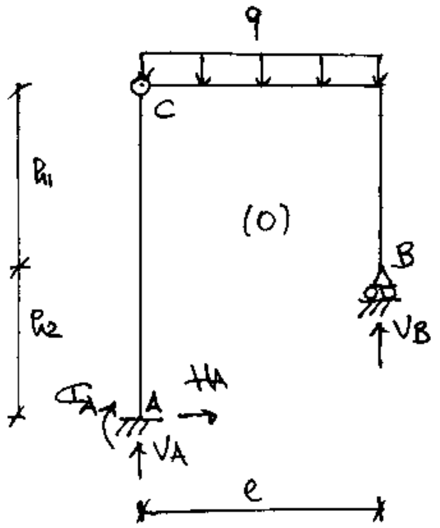


(M)



(T)

Esercizio 4 06/09/02



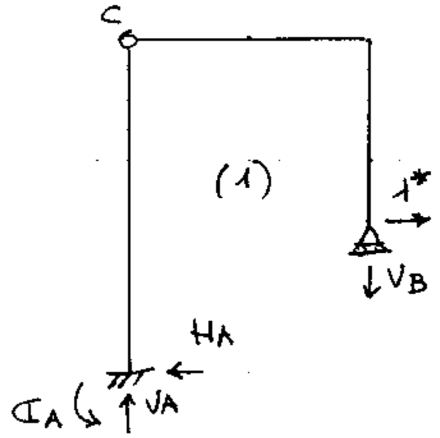
$H_A = 0$

$C \circlearrowleft \quad \mathcal{C}_A = 0$

$C \circlearrowleft \quad V_B \cdot l - q\frac{l^2}{2} = 0 \longrightarrow V_B = q\frac{l}{2}$

$V_A = ql - q\frac{l}{2} = q\frac{l}{2}$

Si applica il teorema dei lavori virtuali prendendo come sistema di spostamenti-deformazioni quello della struttura con il carico q, e come sistema di forze-tensioni quello agente nella struttura seguente:



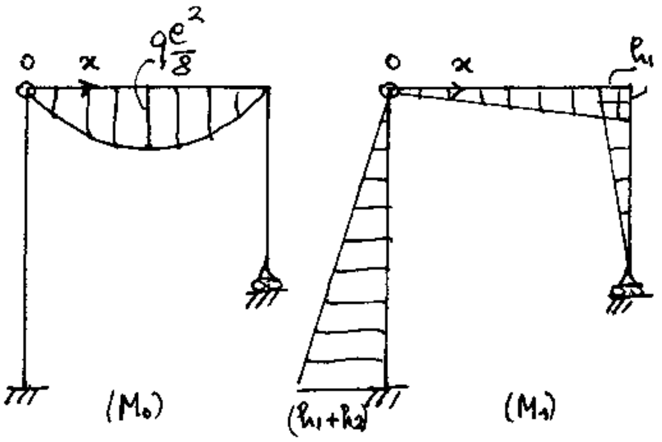
$H_A = 1$

$C \circlearrowleft -V_B \cdot l + 1 \cdot h_1 = 0 \longrightarrow V_B = \frac{h_1}{l}$

$V_A = V_B = \frac{h_1}{l}$

$C \circlearrowleft \quad \mathcal{C}_A - H_A(h_1 + h_2) = 0 \longrightarrow \mathcal{C}_A = (h_1 + h_2)$

Diagrammi dei momenti:



Equazione dei lavori virtuali:(*)

$$EJu_B = \int_0^l \left(h_1 \frac{x}{l}\right)\left(q\frac{l}{2}x - q\frac{x^2}{2}\right)dx$$

$$= \frac{q h_1}{2l}\int_0^l (l x^2 - x^3)\,dx$$

$$= \frac{q h_1}{2l}\left(\frac{l^4}{3} - \frac{l^4}{4}\right) = q\frac{h_1 l^3}{24}$$

$$= 1687.5 \text{ kg cm}^4$$

(*) Le deformazioni assiali si ritengono trascurabili