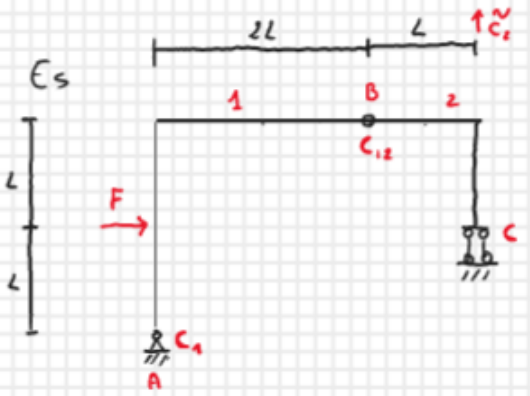
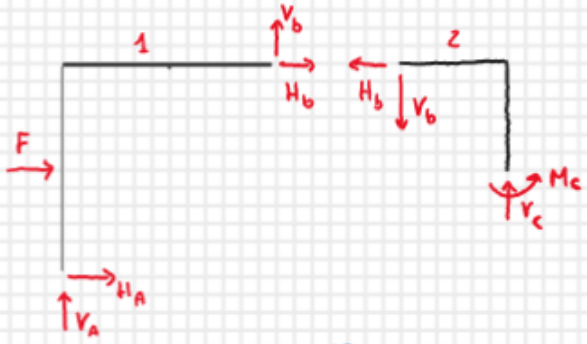
Es



isostatica

C_1, C_2 e C_{12} non sono allineati

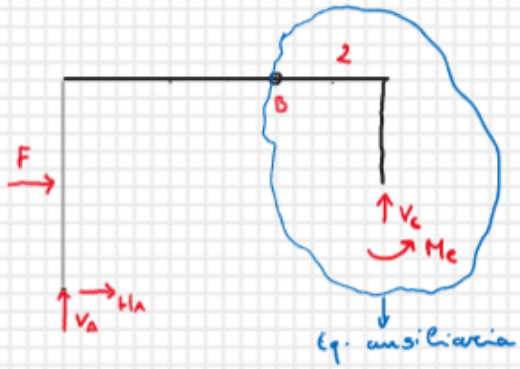


1+2

1
$H_A + H_b + F = 0$
$V_A + V_b = 0$
$-FL + V_b 2L - H_b 2L = 0$

2
$-H_b = 0$
$V_c - V_b = 0$
$-V_c L - M_c = 0$

$H_b = 0$
$H_A = -F$
$V_b = F/2$
$V_A = -F/2$
$V_c = F/2$
$M_c = -\frac{F}{2}L$



E.C.S (struttura intera)

Im A $H_A + F = 0$
$V_A + V_c = 0$
Im A $-FL + M_c + V_c 3L = 0$

Im B $-V_c L - M_c = 0$

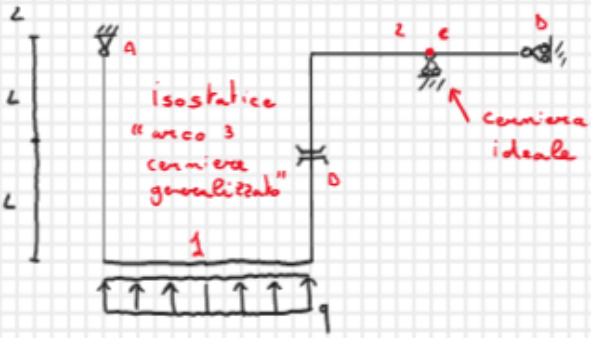
Eq. ausiliaria (Eq di equilibrio parziale)

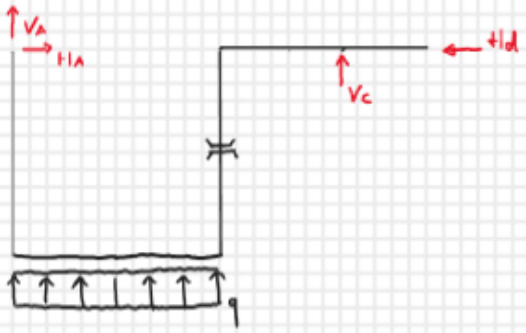
$H_A = -F$ $V_A = -F/2$ $V_c = F/2$ $M_c = -F/2 L$

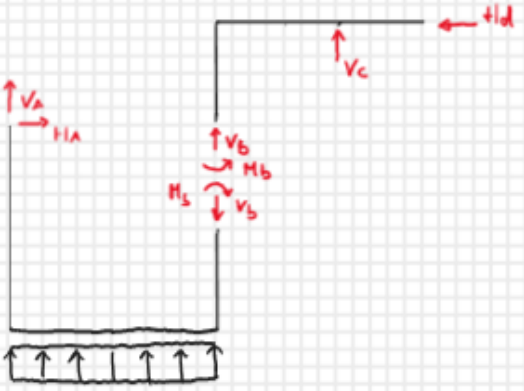
Dopo aver calcolato le R.V. esterne, calcoliamo V_b e H_b

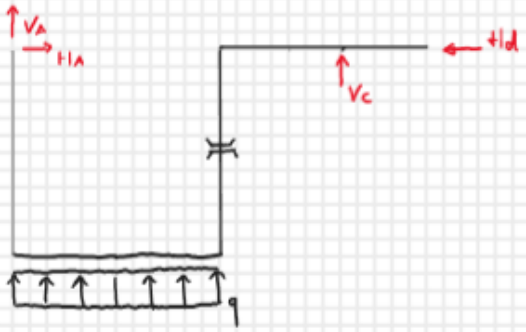
$\begin{cases} H_b = 0 \\ -V_b + F/2 = 0 \end{cases} \rightarrow \begin{matrix} H_b = 0 \\ V_b = F/2 \end{matrix}$

Es 2









$H_A - H_d = 0$

$V_A + V_c + 2qL = 0$

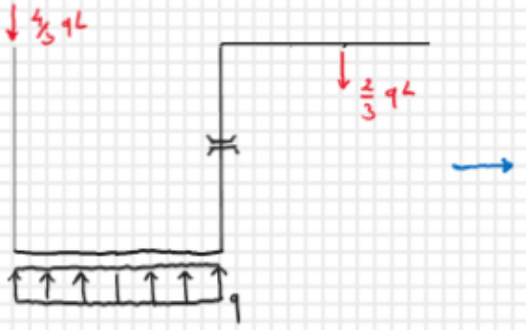
$\mathcal{M}_A \quad -2qL^2 - V_c\, 3L = 0$

} 3 E.C.S

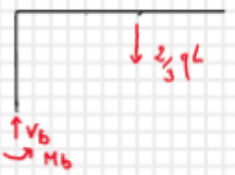
$H_d = 0$ (traslazione orizzontale) Eq. ausiliari

$H_A = 0$ alternativa

$H_d = 0 \quad H_A = 0 \quad V_c = -\frac{2}{3}qL \quad V_A = -\frac{4}{3}qL$



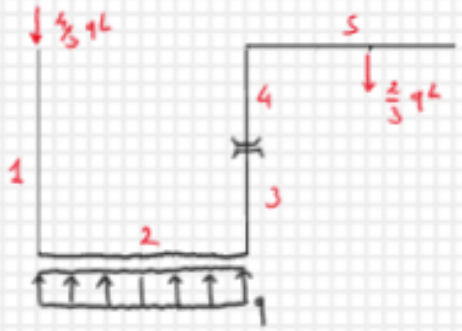
Scelgo tra corpo 1 e il 2 e impongo l'equilibrio

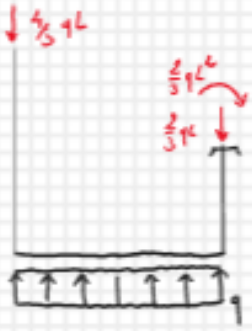


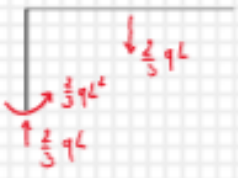
$V_b = \frac{2}{3}qL$

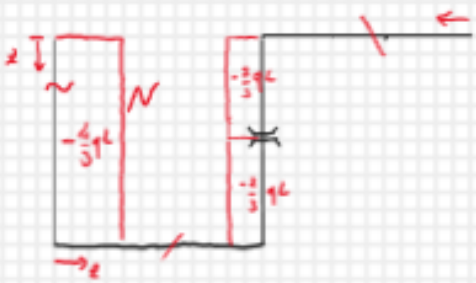
$M_b = \frac{2}{3}qL^2$

Calcolo azioni interne (N, T, M)









$-N(z) - 4/3\,qL = 0$

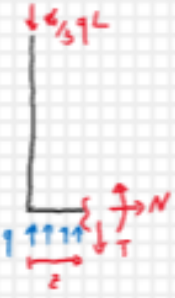
1) $N(z) = -\frac{4}{3}qL$

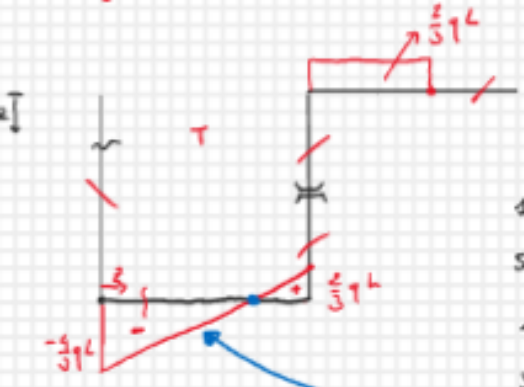
5) $N(z) = 0$

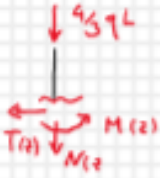
4) $N(z) = -\frac{2}{3}qL$

3) $N(z) = -\frac{4}{3}qL$

2) $N(z) = 0$







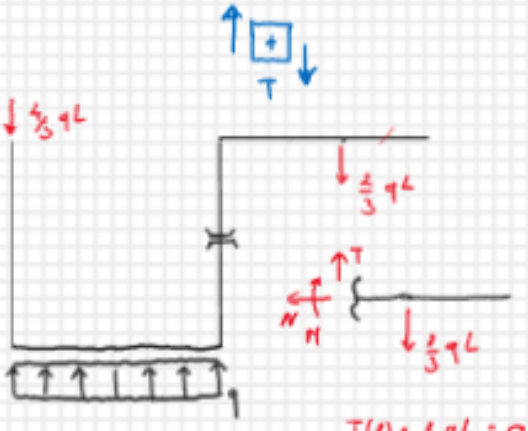
4) $-T(z) = 0$

5) $T(z) = \frac{2}{3}qL$

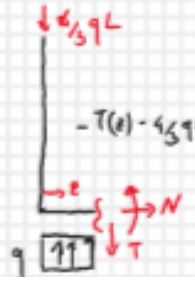
4) $T(z) = 0$

3) $T(z) = 0$

2) $T(z) = -\frac{4}{3}qL + qz$

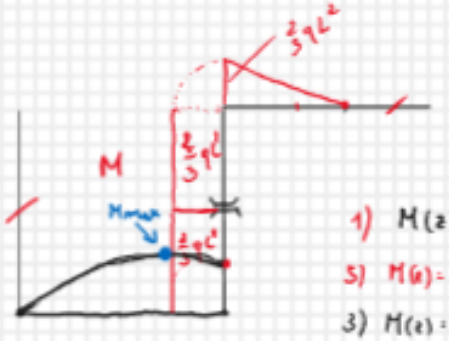


$T(z) - \frac{2}{3}qL = 0$



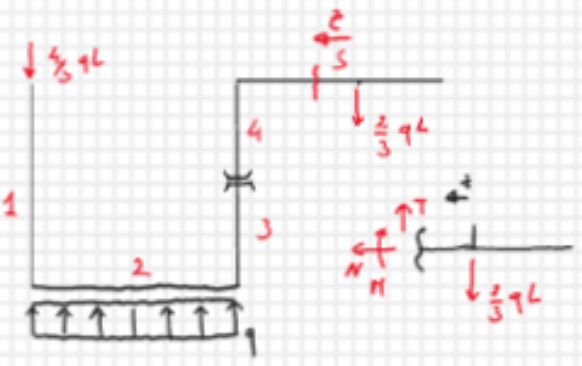
$-T(z) - 4/3\,qL + qz = 0$

$T(z) = -\frac{4}{3}qL + qz = 0 \qquad z = \frac{4}{3}L$



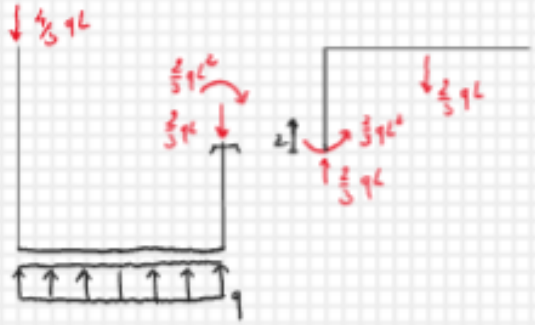
dove $T=0$ $(z=\frac{2}{3}L)$
$M = M_{max}$

1) $M(z)=0$
3) $M(z)=\frac{2}{3}qL^2$
4) $M(z)=\frac{2}{3}qL^2$
2) $M(z)=-\frac{4}{3}qLz+q\frac{z^2}{2}$

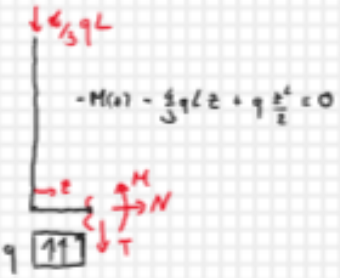


$T(z)-\frac{4}{3}qL=0$

$-M(z)-\frac{4}{3}qLz=0$

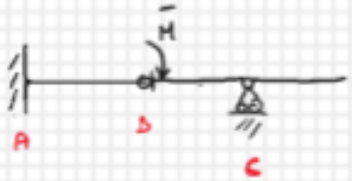


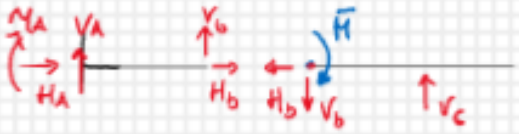
$-M(z)-\frac{4}{3}qLz+q\frac{z^2}{2}=0$



Es 3

$\bar{H}$ a destra della cerniera

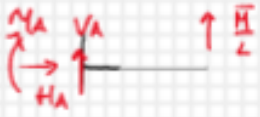




$H_b=0$ $\quad V_b=V_c$ $\quad -\bar{H}+V_cL=0$

$H_b=0$ $\quad V_c=\bar{H}/L$ $\quad V_b=\bar{H}/L$

Risolta la struttura 2, calcolo la 1



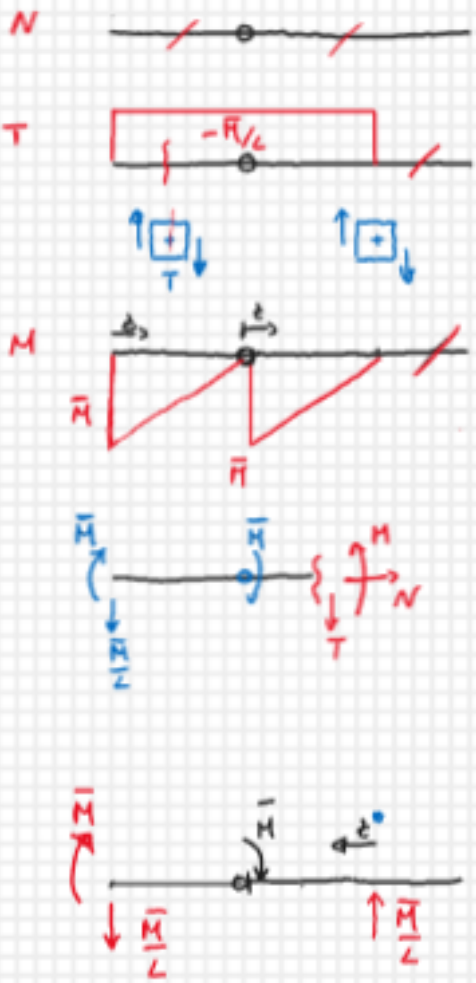
$H_A=0$

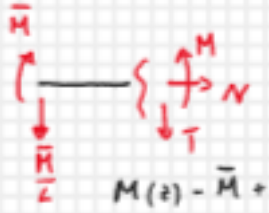
$V_A=-\bar{H}/L$

$M_A=\frac{\bar{H}}{L}L=\bar{H}$

→ Calcolo N, T, M

N





• Tratto 1

$$M(z) - \bar{H} + \frac{\bar{H}}{L} z = 0$$

$$M(z) = \bar{H} - \frac{\bar{H}}{L} z$$

• Tratto 2

$$M(z) - \bar{H} - \bar{H} + \frac{\bar{H}}{L}(L+z) = 0$$

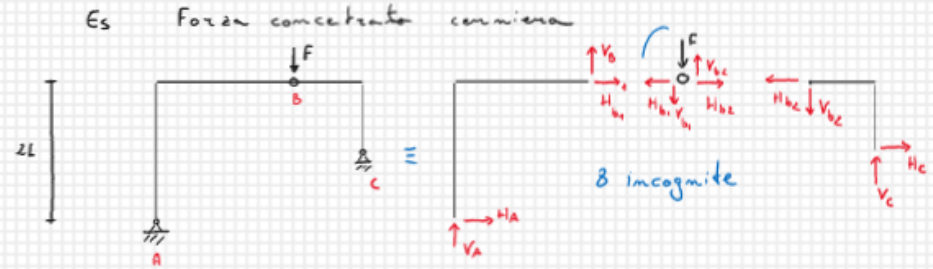
$$M(z) = \bar{H} - \frac{\bar{H}}{L} z$$

$$\Updownarrow$$

$$M(z) = \frac{\bar{H}}{L} z$$ (Alternativa partendo da destra)

• Tratto 3 $M(z) = 0$

Es Forza concentrata cerniera



GECS:
2 E. equilibrio modo

$-H_{b1} + H_{b2} = 0$
$-V_{b1} + V_{b2} - F = 0$ } 2

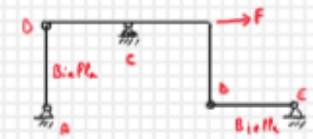
$H_A + H_C = 0$
$V_A + V_C = F$
$-2FL + H_C L + 3V_C L = 0$
$-H_C L - V_C L = 0$ eq. ausiliaria

$H_A = \frac{F}{2}$
$H_C = -F/2$
$V_A = F/2$
$V_C = F/2$

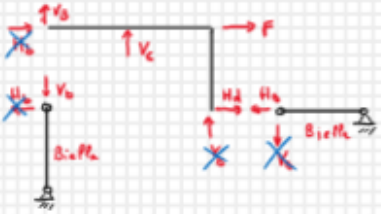
$-H_{b2} - \frac{F}{2} = 0$ $H_{b2} = -\frac{F}{2}$
$V_{b2} = F/2$

$H_{b1} = -F/2$
$V_{b1} = -\frac{F}{2}$

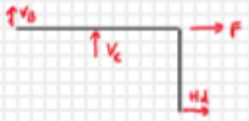
Es



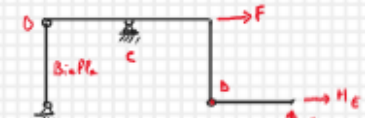
Biella: asta scarica con cerniere agli estremi
Taglio e M. flettente nulli
$N \neq 0$



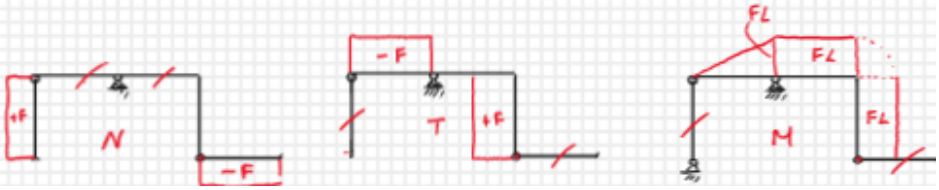
Essendo bielle
H_B e $V_A = 0$



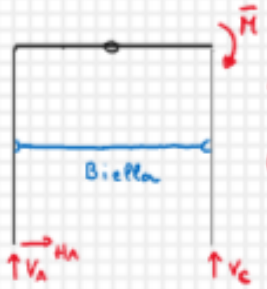
$H_A = -F$
$V_B = -F$
$V_C = F$



Eq rispetto a D (Rotazione)
$-V_E \cdot L = 0$ $V_E = 0$



- "Strutture chiuse"

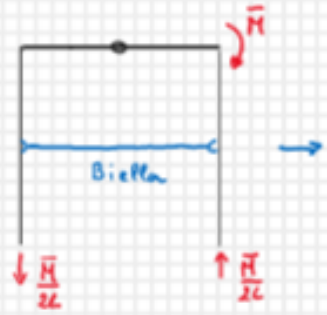


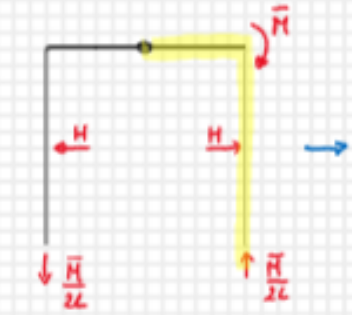
$H_A = 0$

$V_A + V_C = 0$

$-\bar{M} + 2V_C L = 0$

$H_A = 0 \quad V_C = \frac{\bar{M}}{2L} \quad V_A = -\frac{\bar{M}}{2L}$

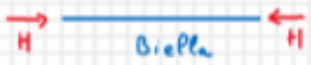


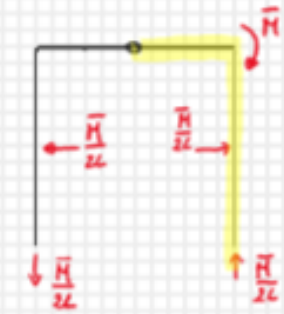


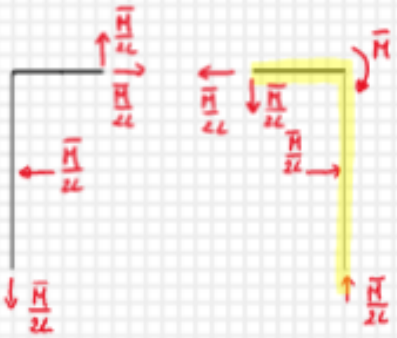
Eq. rotazione rispetto alla cerniera relativa

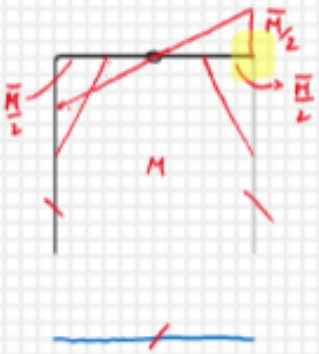
$-\bar{M} + \frac{\bar{M}}{2L} K + HL = 0$

$H = \frac{\bar{M}}{2L}$



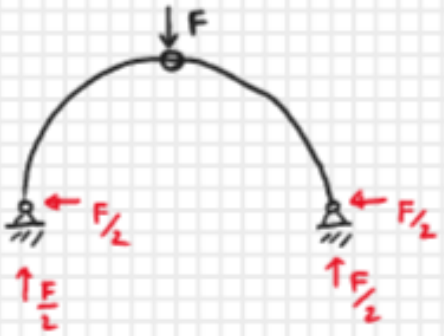


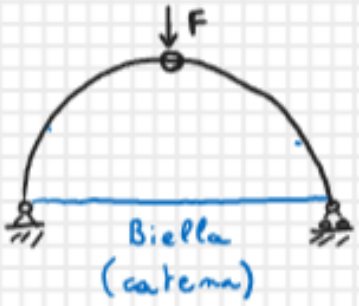




Verifica modo giusto

$\Sigma M = 0$

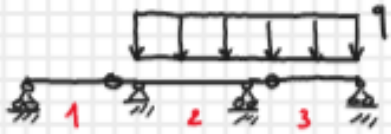


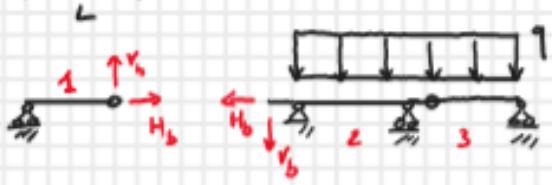


Biella tesa

$N = \frac{F}{\cos\alpha}$

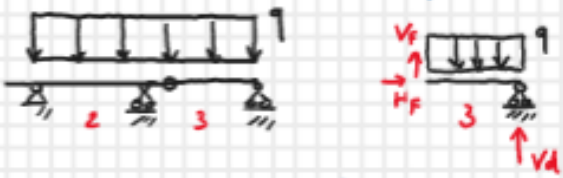
Es Trave Gerber





$H_b = 0 \quad V_b = 0$

(struttura 1 Scarica)

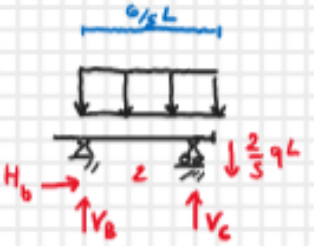


Risolvo 3

$H_F = 0$

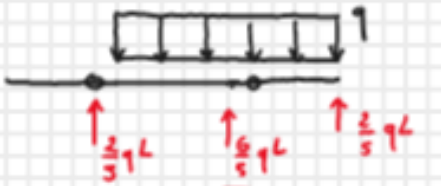
$V_F = V_d = \frac{2}{5} qL$

Infine risolvo la 2

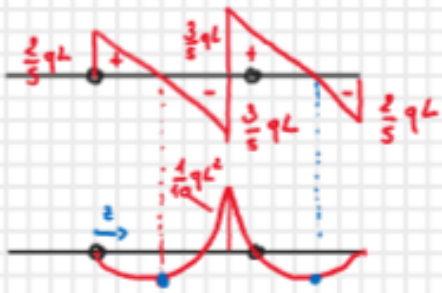


$H_b = 0$

$V_b = \frac{2}{5} qL \qquad V_c = \frac{6}{5} qL$



$N = 0$



$M(z) = \frac{2}{5} qL z - q\frac{z^2}{2}$