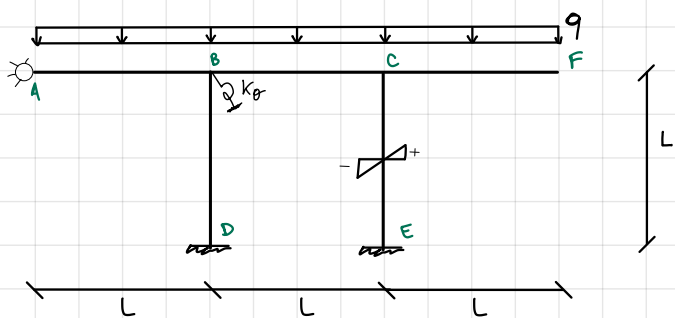


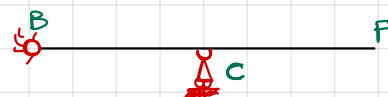
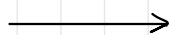
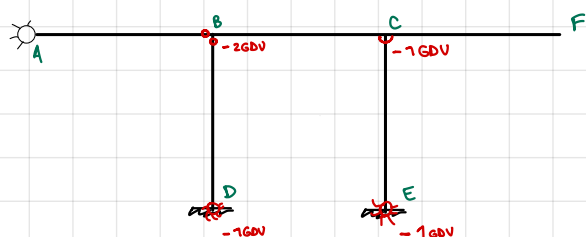


$$\left. \begin{array}{l} GDL = 3 \\ GDU = 8 \end{array} \right\} 5 - \text{iperstatica}$$

$$K_{\theta} = \frac{2}{3} \frac{ES}{L}$$

$$\frac{\alpha \Delta T}{H} = \frac{37}{12} \frac{qL^2}{EJ}$$

ANALISI CINEMATICA:



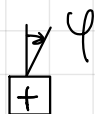
NOI FISSI

INCOGNITE: φ_B ; φ_C

SISTEMA RISOLVENTE:

$$\begin{cases} m_{BB} \varphi_B + m_{BC} \varphi_C + m_{B0} = 0 \\ m_{CB} \varphi_B + m_{CC} \varphi_C + m_{C0} = 0 \end{cases}$$

CONVENZIONI DI SEGNO:

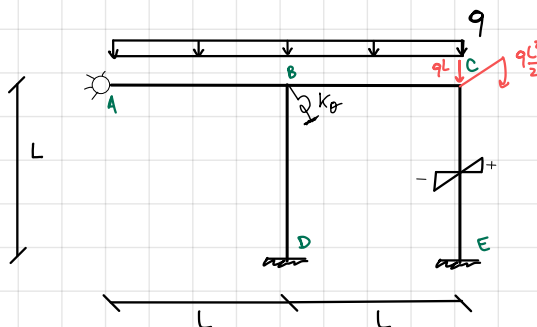
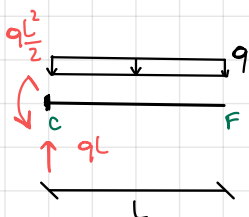


ROTAZIONI

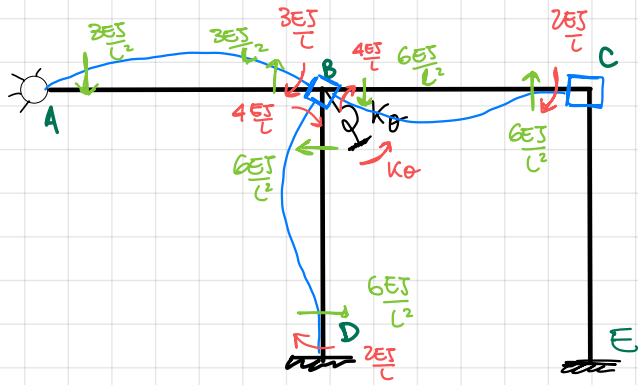


MOMENTI

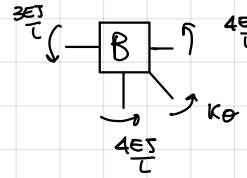
APPENDICE ISO STATICA:



$$\psi_B = 1$$

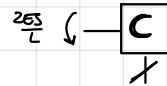


NODO B:



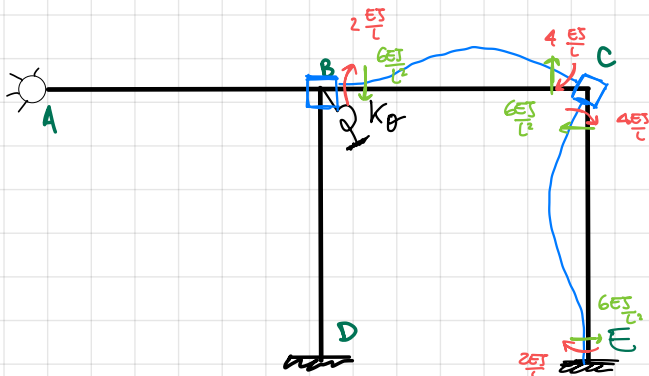
$$M_{BB} = 11 \frac{EI}{L} + K_\theta$$

NODO C:

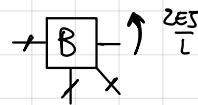


$$M_{cB} = 2 \frac{EI}{L}$$

$$\psi_c = 1$$

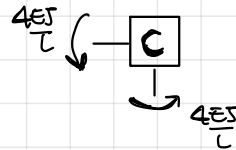


NODO B:



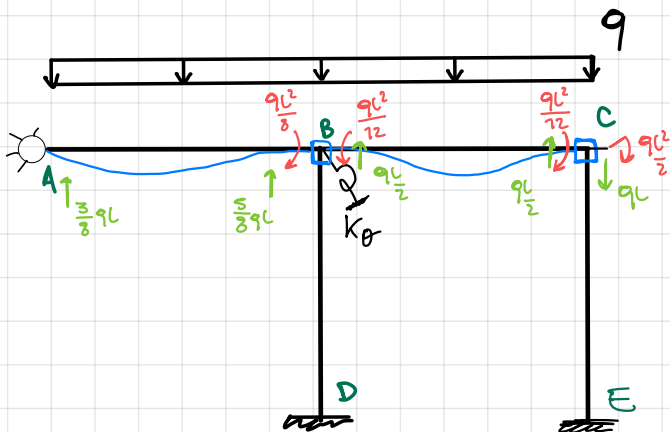
$$M_{Bc} = 2 \frac{EI}{L}$$

NODO C:

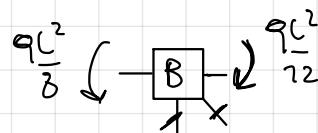


$$M_{cC} = 8 \frac{EI}{L}$$

$$q \neq 0$$

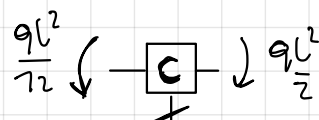


NODO B:



$$M'_{B0} = \frac{qL^2}{24}$$

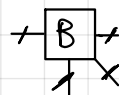
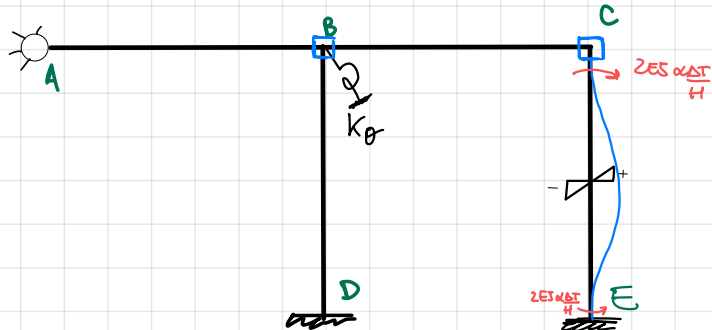
NODO C:



$$M'_{c0} = -\frac{5}{12} qL^2$$

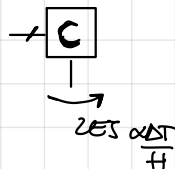
$$\Delta T \neq 0$$

NODO B:



$$m_{B0}'' = 0$$

NODO C:



$$m_{C0}'' = \frac{2ES \alpha \Delta T}{H}$$

SISTEMA RISOLVENTE

$$\begin{cases} \left(11 \frac{ES}{L} + k_{\theta} \right) \varphi_B + \frac{2ES}{L} \varphi_C + \frac{qL^2}{24} = 0 \\ \frac{2ES}{L} \varphi_B + \frac{8ES}{L} \varphi_C - \frac{5}{12} qL^2 + 2\alpha \frac{\Delta T}{H} = 0 \end{cases}$$

$$\begin{cases} \left(\frac{35}{3} \frac{ES}{L} \varphi_B + \frac{2ES}{L} \varphi_C + \frac{qL^2}{24} = 0 \right) \cdot (-4) \\ \frac{2ES}{L} \varphi_B + \frac{8ES}{L} \varphi_C + \frac{23}{4} qL^2 = 0 \end{cases}$$

$$-\frac{134}{3} \frac{ES}{L} \varphi_B + 0 + \frac{134}{24} qL^2 = 0$$

DA CUI: $\varphi_B = \frac{3}{24} \frac{qL^3}{ES} = \frac{1}{8} \frac{qL^3}{ES}$

ALTRA II EQUAZIONE:

$$\frac{qL^2}{4} + \frac{8ES}{L} \varphi_C + \frac{23}{4} qL^2 = 0$$

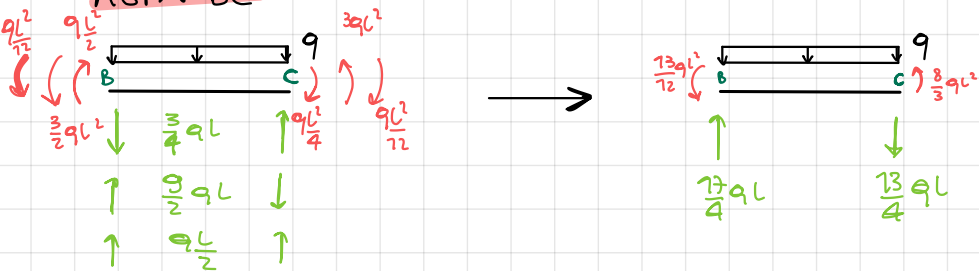
DA CUI: $\varphi_C = \frac{1}{8} \left(-\frac{23}{4} - \frac{1}{4} \right) \frac{qL^3}{ES} = -\frac{3}{4} \frac{qL^3}{ES}$

$-\frac{24}{4} = -6$

ASTA AB



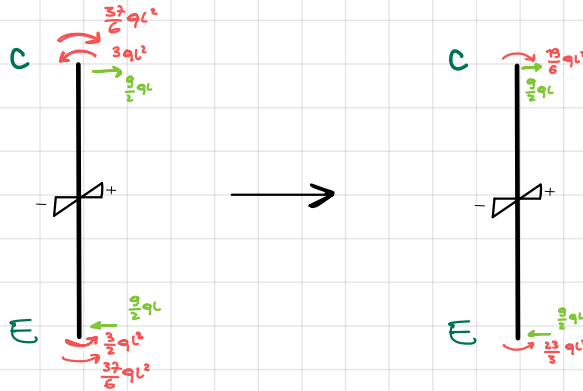
ASTA BC



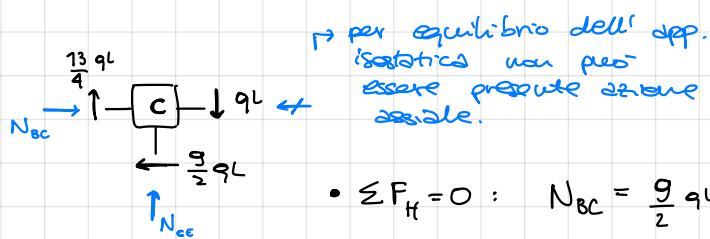
ASTA BD



ASTA CE

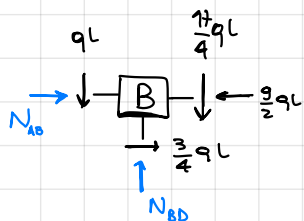


EQUILIBRI AL NODO:



$$\sum F_H = 0 : N_{BC} = \frac{9}{2} qL$$

$$\sum F_V = 0 : N_{CE} = qL - \frac{13}{4} qL = -\frac{9}{4} qL$$

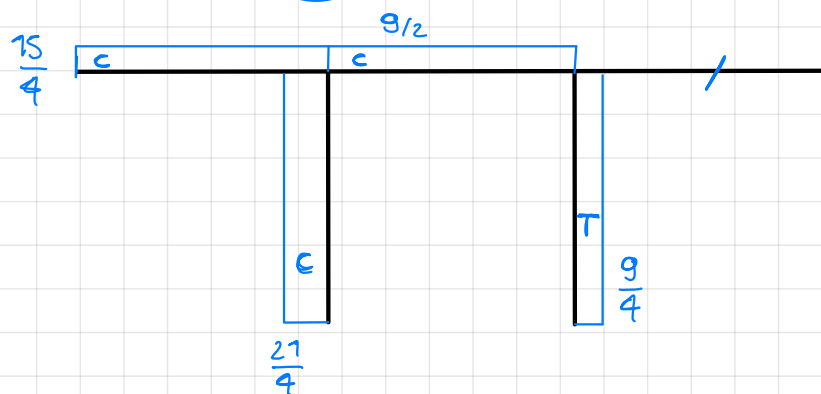


$$\sum F_H = 0 : N_{AB} = \frac{9}{2} qL - \frac{3}{4} qL = \frac{15}{4} qL$$

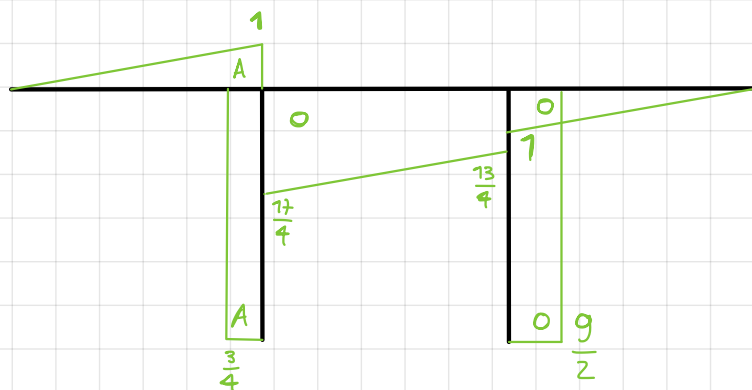
$$\sum F_V = 0 : N_{BD} = \frac{17}{4} qL + qL = \frac{21}{4} qL$$

DIAGRAMMI:

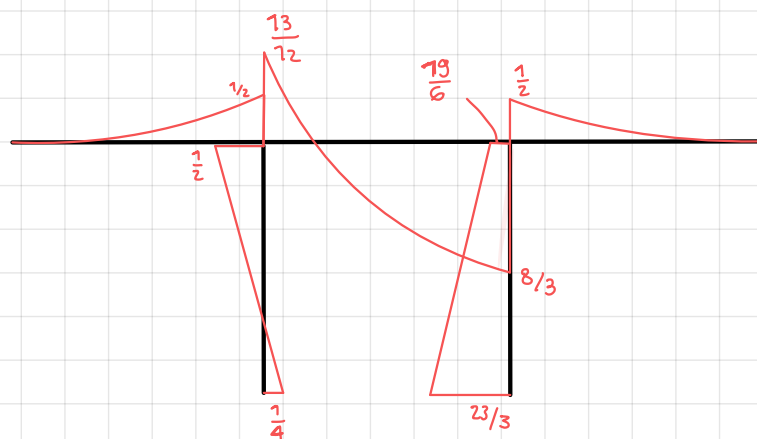
N/qL



V/qL

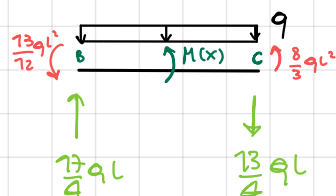


M/qL^2



PUNTI DI FLESSO:

ASTA BC:



$$M(x) = -\frac{13}{12} qL^2 + \frac{17}{4} qLx - q \frac{x^2}{2}$$

$$M(x) = 0 \rightarrow x^2 - \frac{17}{2} Lx + \frac{13}{6} L^2 = 0$$

$$x_{1,2} = \frac{1}{2} \left(\frac{17}{2} \pm \sqrt{\frac{763}{12}} \right) = \begin{cases} \approx 0.26L & \text{ok!} \\ > L & \text{non acc.} \end{cases}$$

ASTA BD:

$$\frac{1}{4} : \left(\frac{1}{2} + \frac{1}{4} \right) = x : L \rightarrow x = \frac{L}{4} \cdot \frac{4}{3} = \frac{L}{3}$$

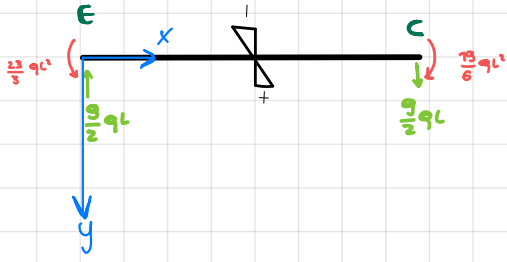
ASTA

CE :

curvature term

(-) (+)

$$y'' = - \frac{M(x)}{EI} - 2\alpha \frac{\Delta T}{H}$$



$$M(x) = - \frac{23}{3} qL^2 + \frac{9}{2} qLx$$

$$y'' = \frac{1}{EI} \left(\frac{23}{3} qL^2 - \frac{9}{2} qLx - \frac{37}{6} qL^2 \right)$$

$$y'' \geq 0 : \frac{23}{3} qL^2 - \frac{9}{2} qLx - \frac{37}{6} qL^2 \geq 0$$

$$x \leq \frac{2}{9} \left(-\frac{37}{6} + \frac{23}{3} \right) L \rightarrow x \leq \frac{L}{3}$$

DEFORMATA :

