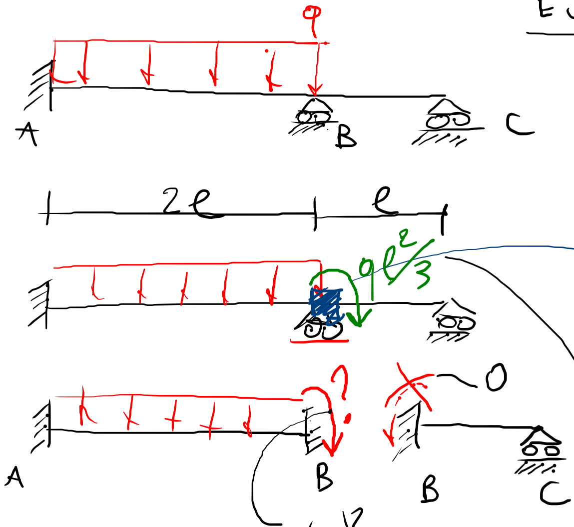
… CARICHI IN CAMPATA: SCHEMI I e II

22/12/22

EJ: cost.



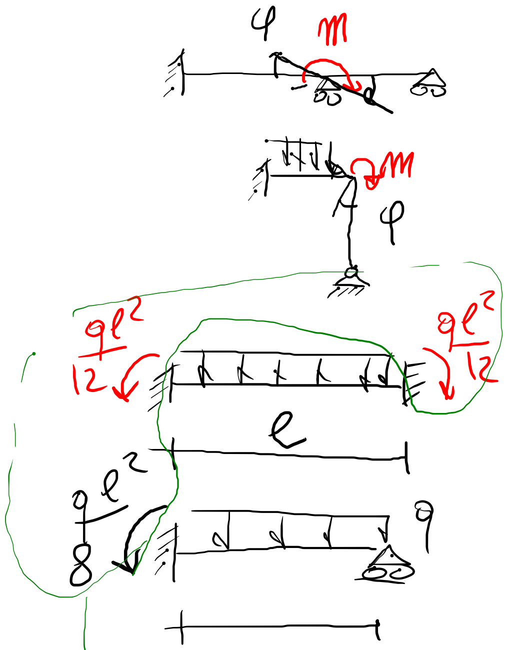
$$\frac{q(2\ell)^2}{12} = \frac{q\ell^3}{3}$$

ROTAZ. NODALE INDIPENDENTE: φ_B

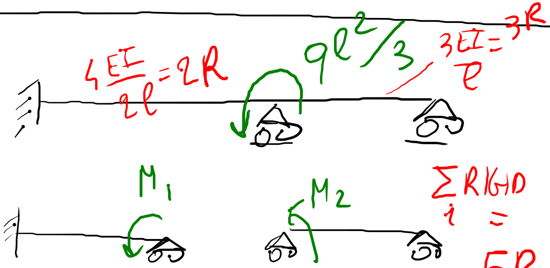
VINCOLO AUSILIARIO (INCASTRO): BLOCCA φ_B

REAZ. VINCOLARE TOTALE DELL'INCASTRO AUSILIARIO

SCHEMA I



MOM DI INCASTRO PERFETTO



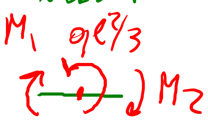
$\sum_i \text{RIGID} = 5R$

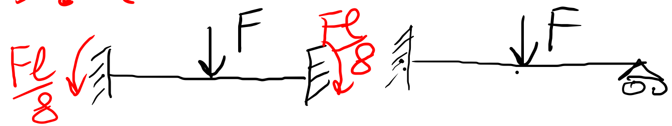
$$M_1 = \frac{2}{5}\,\frac{q\ell^2}{3} = \frac{2}{15}\,q\ell^2$$

$$M_2 = \frac{3}{5}\,\frac{q\ell^2}{3} = \frac{1}{5}\,q\ell^2$$

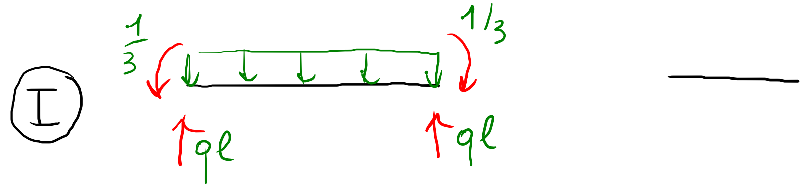
SCHEMA II

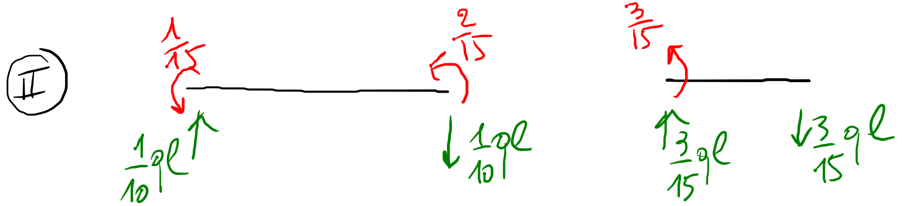
NODO B

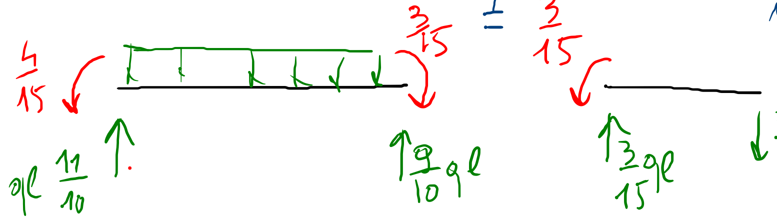




SCL

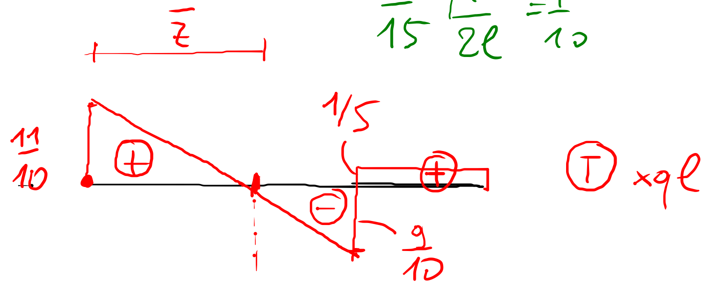


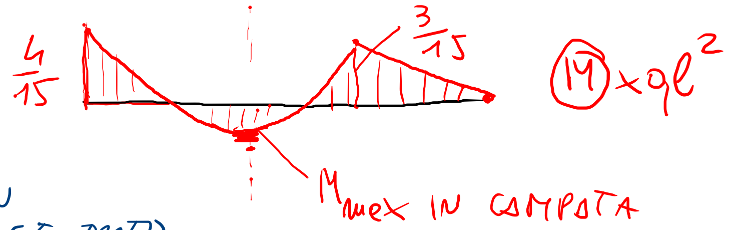


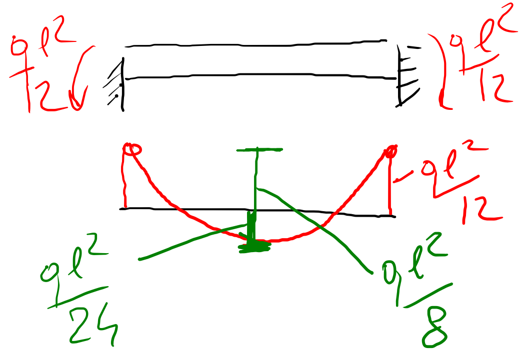


OK, PERCHÉ IN B NON C'È NESSUN MOMENTO CONCENTRATO

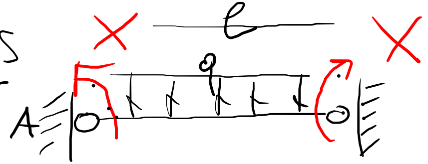
$\frac{3}{15}\frac{ql^2}{2l} = \frac{1}{10}$

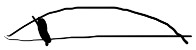






ES





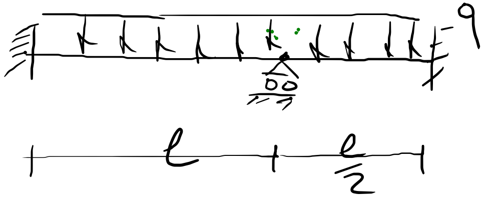
$\boxed{\varphi_A = 0}$ EQ DI CONGR. ↶+

$$\frac{X\ell}{3EJ} + \frac{X\ell}{6EJ} - \frac{q\ell^3}{24EJ} = 0$$

$$\frac{X\cancel{\ell}}{2\cancel{EJ}} = \frac{q\ell^{\cancel{3}\,2}}{24\cancel{EJ}}$$

$$\boxed{X = \frac{q\ell^2}{12}}$$

ES



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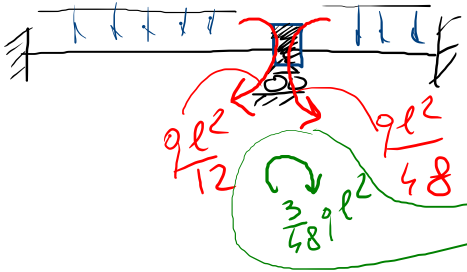
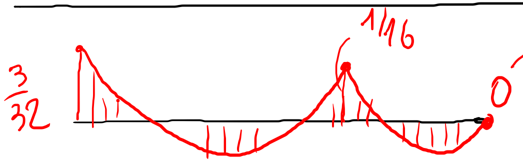


SCH. I

MOM TOTALE ALL'INCASTRO AUSILIARIO

SCH. II

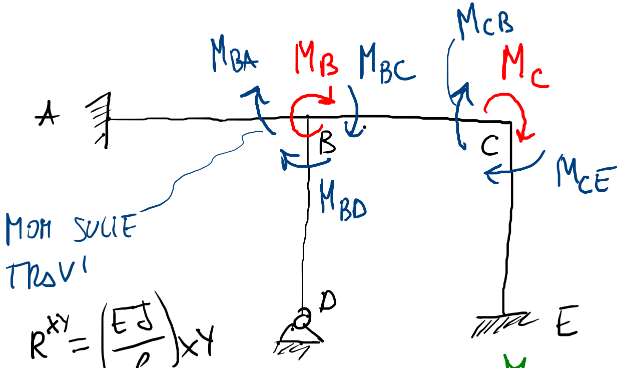


È CASUALE CHE VENGA 0

M $\times q\ell^2$

RIPARTIZIONE DI MOMENTI NODALI IN TELAI A NODI FISSI CON PIÙ GRADI DI LIBERTÀ

↻+ [φ_B, φ_C : ROTAZIONI NODALI INCOGNITE]



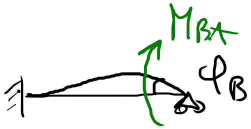
$$R^{xy} = \left(\frac{EJ}{l}\right)_{xy}$$

$$\begin{cases} M_B = M_{BA} + M_{BC} + M_{BD} \\ M_C = M_{CB} + M_{CE} \end{cases}$$

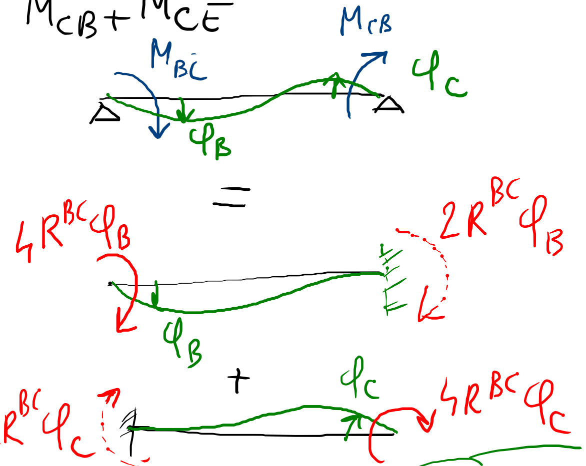
EQUAZ. DI EQUIVALENZA

$\odot \Rightarrow \varphi_B$

$\odot \Rightarrow \varphi_C$



I
$$\begin{cases} M_{BA} = 4R^{AB}\varphi_B \\ M_{BD} = 3R^{BD}\varphi_B \\ M_{BC} = 4R^{BC}\varphi_B + 2R^{BC}\varphi_C \\ M_{CB} = 2R^{BC}\varphi_B + 4R^{BC}\varphi_C \\ M_{CE} = 4R^{CE}\varphi_C \end{cases}$$



$$\begin{cases} M_B = (\underbrace{4R^{AB} + 4R^{BC} + 3R^{BD}}_{K_{BB}})\varphi_B + \underbrace{2R^{BC}}_{K_{BC}}\varphi_C \\ M_C = \underbrace{2R^{BC}}_{K_{CB}}\varphi_B + (\underbrace{4R^{BC} + 4R^{CE}}_{K_{CC}})\varphi_C \end{cases}$$

$$\boxed{\begin{bmatrix} K_{BB} & K_{BC} \\ K_{CB} & K_{CC} \end{bmatrix} \begin{bmatrix} \varphi_B \\ \varphi_C \end{bmatrix} = \begin{bmatrix} M_B \\ M_C \end{bmatrix}}$$

→ MATRICE DI RIGIDEZZA: $[\underset{\sim}{K}]$

(È DEFINITA POSITIVA)

$$[K][\varphi]=[M]$$

$$[\varphi]=[K^{-1}][M]$$

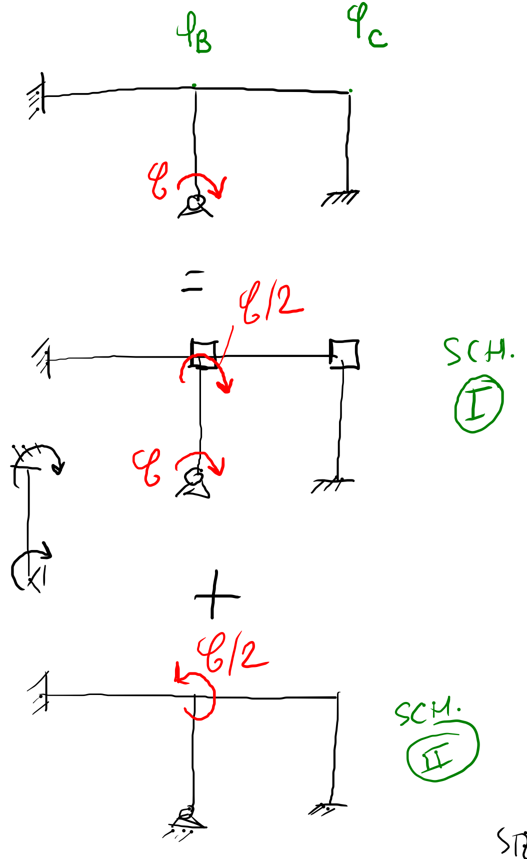
$[K^{-1}]$ ESISTE SEMPRE

NOTI φ_B e φ_C PER SAPERE I MOMENTI NELLE TRAVI TORNO ALLA TABELLA 1

$[K]$ È SIMMETRICA PER LA SIMMETRIA DEI COEFF DI INFLUENZA.

INFATTI SI PUÒ DIMOSTRARE GLI ELEMENTI DI $[K]$ SONO "COLLEGATI" DA QUELLI DELLA MATRICE $[H]$

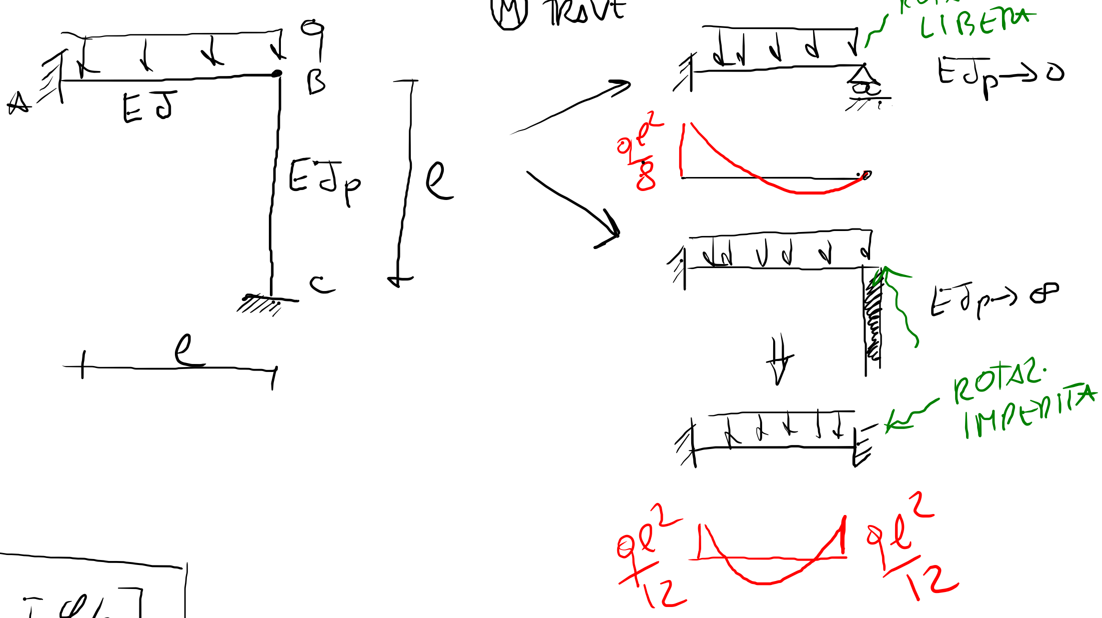
PROBLEMA CON "CARICO NON NODALE"



$$[K]\begin{bmatrix}\varphi_B \\ \varphi_C\end{bmatrix} = \begin{bmatrix}-C/2 \\ 0\end{bmatrix}$$

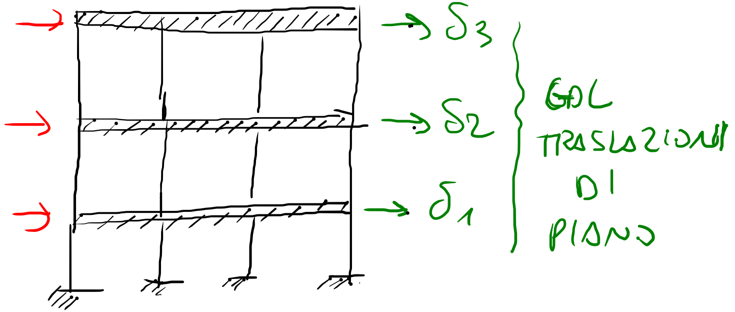
STESSA MATRICE DI RIGIDEZZA DI PRIMA

ES SUI MOMENTI MASSIMI E MINIMI IN ALCUNI CASI LIMITE

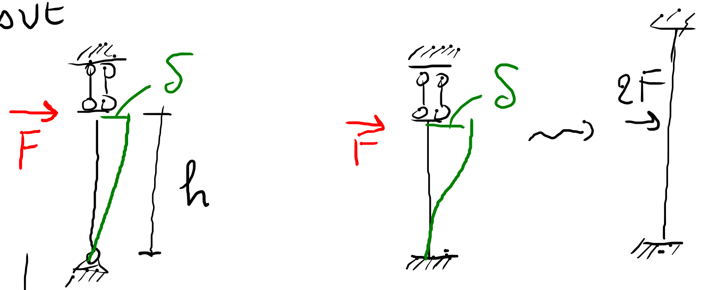


IL DIAGRAMMA M DELLA TRAVE SARÀ UNA PARABOLA "COMPRESA" TRA LE DUE DEI CASI LIMITE STUDIATI.

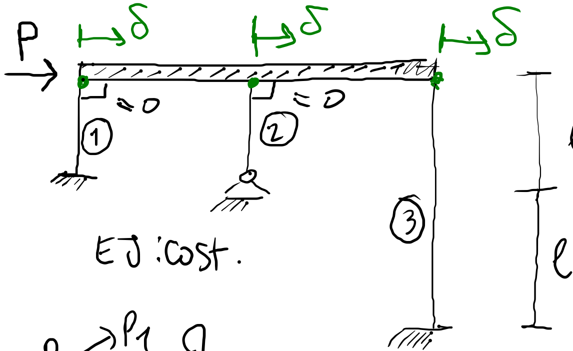
TELAI SHEAR-TYPE (TRAVI ORIZZONTALI INFINITAM. RIGIDE) ⇒ SI RISOLVONO CON IL METODO DEGLI SPOSTAM.
(TRASCURANDO EA DEI PILASTRI)



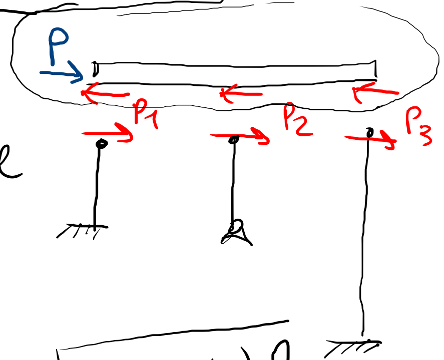
EQ. DI EQUILIBRIO DELLA TRAVE : $P - P_1 - P_2 - P_3 = 0$



$$\delta = \frac{Fh^3}{12EJ}$$

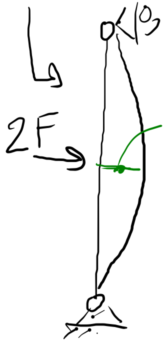


EJ: cost.

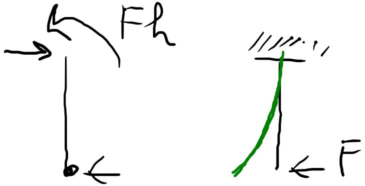


$$P \to P_1,\ P_2,\ P_3 \ ?$$

$$\boxed{P_i = P_i(\delta)} \ ?$$



$$\delta = \frac{2F \cdot (2h)^3}{48EJ} = \frac{Fh^3}{EJ}\,\frac{16}{48} = \frac{1}{3}\frac{Fh^3}{EJ}$$

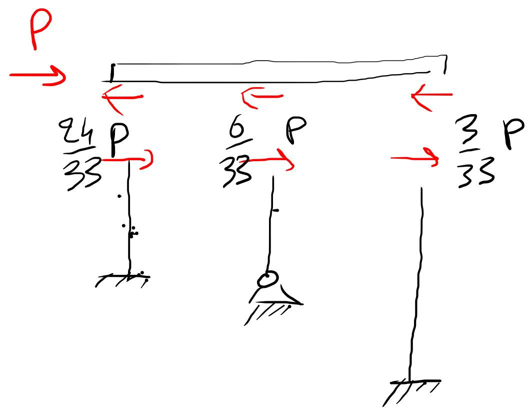


$$\delta = Fh^3/3EJ$$

$$\left[P - \frac{12EJ}{\ell^3}\delta - \frac{3EJ}{\ell^3}\delta - \frac{12}{8}\frac{EJ}{\ell^3}\delta = 0 \right]$$

$$P = \frac{EJ}{\ell^3}\delta\left(12+3+\frac{3}{2}\right) = \frac{33}{2}\frac{EJ}{\ell^3}\delta$$

$$\boxed{\delta = \frac{2}{33}\frac{P\ell^3}{EJ}}$$



$$P_1 = \frac{12EJ}{\ell^3}\delta = 12\cdot\frac{2}{33}P = \frac{24}{33}P \quad \rho_1$$

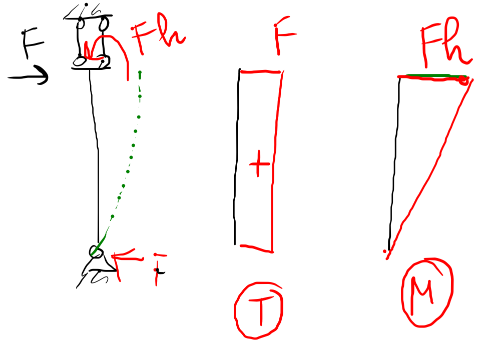
$$P_2 = \frac{3EJ}{\ell^3}\delta = 3\,\frac{2}{33}P = \frac{6}{33}P \quad \rho_2$$

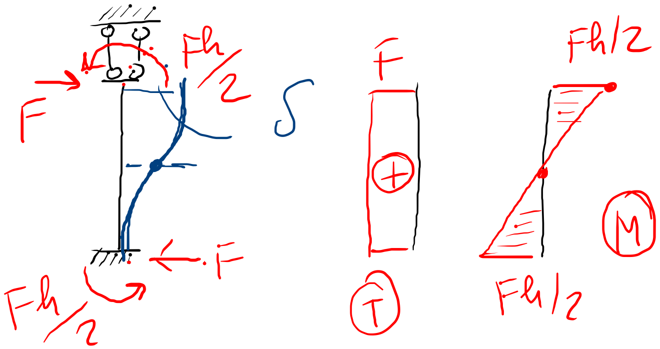
$$P_3 = \frac{12EJ}{(2\ell)^3}\delta = \frac{3}{2}\cdot\frac{2}{33}P = \frac{3}{33}P \quad \rho_3$$

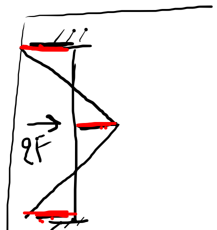
$$1\,P$$

$\sum_i \rho_i = 1$

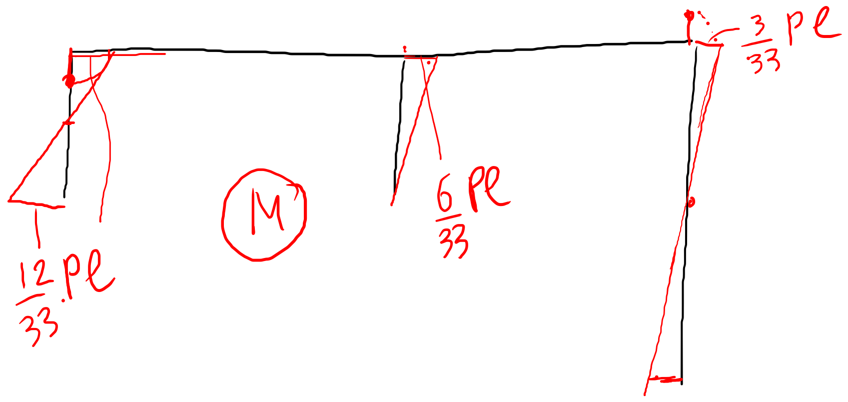
COEFF DI RIPARTIZIONE







$$\frac{2F\cdot 2h}{8} = \frac{Fh}{2}$$



SE LA TRAVE È COLLEGATA CON 3 O PIÙ PILASTRI I DIAGRAMMI T e M DELLA TRAVE SONO INCOGNITI PERCHÉ È NECESSARIO CONOSCERE LE FORZE NORMALI NEI PILASTRI

IL MODELLO SHEAR-TYPE FORNISCE DIRETTAMENTE T ED M DEI PILASTRI E N DELLA TRAVE, MENTRE PER CALCOLARE N DEI PILASTRI E M E T DELLA TRAVE OCCORRE RISOLVERE UN SECONDO SCHEMA: