Titolo nota 06/06/2013

$$\frac{d^4 v}{dz^4} + 4\lambda^4 v = 0$$

OMOGENEA

$$v = e^{\lambda x} \sin \lambda x$$

$$v' = \lambda e^{\lambda x} \sin \lambda x + \lambda e^{\lambda x} \cos \lambda x$$

$$v = e^{\lambda x} \cos \lambda x$$

$$v' = \lambda e^{\lambda x} \cos \lambda x - \lambda e^{\lambda x} \sin \lambda x$$

$$v = e^{\lambda x} \sin \lambda x$$

$$v' = \lambda e^{\lambda x} \sin \lambda x + \lambda e^{\lambda x} \cos \lambda x$$

$$v'' = \lambda^2 \cancel{e^{\lambda x}} \sin \lambda x + \lambda^2 e^{\lambda x} \cos \lambda x + \lambda^2 e^{\lambda x} \cos \lambda x - \lambda^2 \cancel{e^{\lambda x}} \sin \lambda x$$

$$= 2 \lambda^2 e^{\lambda x} \cos \lambda x$$

$$v''' = 2 \lambda^3 e^{\lambda x} \cos \lambda x - 2 \lambda^3 e^{\lambda x} \sin \lambda x$$

$$v^{iv} = 2\lambda^4 \cancel{e^{\lambda x}} \cos \lambda x - 2\lambda^4 e^{\lambda x} \sin \lambda x - 2\lambda^4 e^{\lambda x} \sin \lambda x$$

$$- 2\lambda^4 \cancel{e^{\lambda x}} \cos \lambda x = -4 \lambda^4 e^{\lambda x} \sin \lambda x$$

$$v = C_1 e^{\lambda x} \sin\lambda x + C_2 e^{\lambda x} \cos\lambda x + C_3 e^{-\lambda x} \sin\lambda x + C_4 e^{-\lambda x} \cos\lambda x$$

$$\frac{d^4 v}{dz^4} + 4\,\lambda^4\, v = 0$$

e la soluzione è

$$v(z) = C_1\, e^{\lambda z} \sin\lambda z + C_2\, e^{\lambda z} \cos\lambda z + C_3\, e^{-\lambda z} \sin\lambda z + C_4\, e^{-\lambda z} \cos\lambda z$$

La derivata della 14 fornisce la rotazione sezione per sezione

$$v'(z) = C_1\, \lambda\, e^{\lambda z} \left(\sin\lambda z + \cos\lambda z\right) + C_2\, \lambda\, e^{\lambda z} \left(-\sin\lambda z + \cos\lambda z\right) + \\ + C_3\, \lambda\, e^{-\lambda z} \left(-\sin\lambda z + \cos\lambda z\right) + C_4\, \lambda\, e^{-\lambda z} \left(-\sin\lambda z - \cos\lambda z\right) = -\varphi$$

La derivata seconda è in relazione al momento flettente, ed è

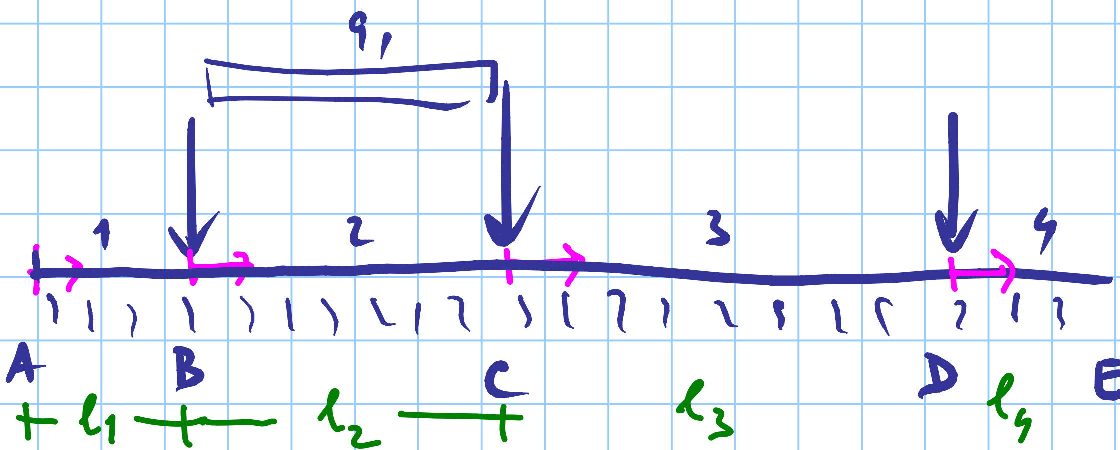
$$v''(z) = 2\, C_1\, \lambda^2\, e^{\lambda z} \cos\lambda z - 2\, C_2\, \lambda^2\, e^{\lambda z} \sin\lambda z + \\ - 2\, C_3\, \lambda^2\, e^{-\lambda z} \cos\lambda z + 2\, C_4\, \lambda^2\, e^{-\lambda z} \sin\lambda z = -\frac{M}{EI}$$

La derivata terza è legata al taglio

$$v'''(z) = 2\, C_1\, \lambda^3\, e^{\lambda z} \left(-\sin\lambda z + \cos\lambda z\right) + 2\, C_2\, \lambda^3\, e^{\lambda z} \left(-\sin\lambda z - \cos\lambda z\right) + \\ + 2\, C_3\, \lambda^3\, e^{-\lambda z} \left(\sin\lambda z + \cos\lambda z\right) + 2\, C_4\, \lambda^3\, e^{-\lambda z} \left(-\sin\lambda z + \cos\lambda z\right) = -\frac{V}{EI}$$

$$\frac{d^4 v}{dz^4} + 4\lambda^4 v = \frac{q'}{EI} \qquad \lambda = \sqrt[4]{\frac{kb}{4EI}}$$

se $q = \text{cost}$ $\qquad v = \frac{1}{4\lambda^4}\frac{q'}{EI} = \frac{q'}{kb}$



$$v_1 = C_{1,1} e^{\lambda x} \sin \lambda x + \dots$$

$$v_2 = C_{1,2} e^{\lambda x} \sin \lambda x + \dots \qquad + \frac{q'}{kb}$$

$$v_3 = C_{1,3} e^{\lambda x} \sin \lambda x + \dots$$

$$v_4 = C_{1,4} e^{\lambda x} \sin \lambda x + \dots$$

$$\varphi_{B,s} = \varphi_{B,d}$$

$$-v_1'(\ell_1) = -v_2'(0)$$

$$v'(z) = C_1 \lambda e^{\lambda z} (\sin \lambda z + \cos \lambda z) + C_2 \lambda e^{\lambda z} (-\sin \lambda z + \cos \lambda z) +$$
$$+ C_3 \lambda e^{-\lambda z} (-\sin \lambda z + \cos \lambda z) + C_4 \lambda e^{-\lambda z} (-\sin \lambda z - \cos \lambda z) = -\varphi$$

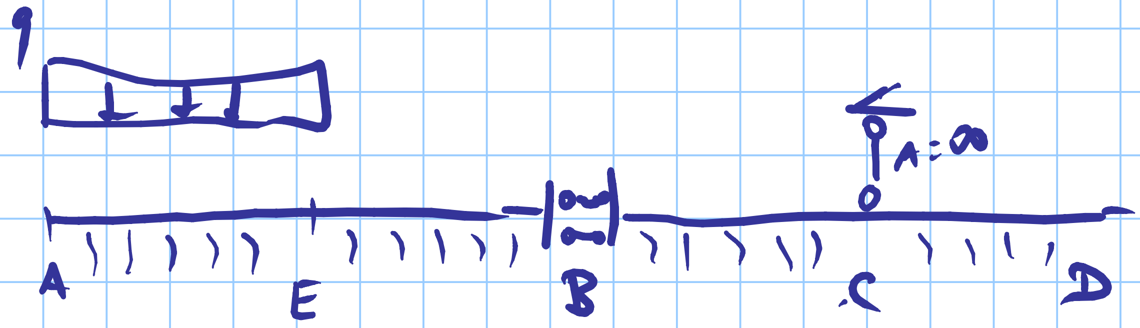
$$-C_{1,1} \lambda e^{\lambda \ell_1} (\sin \lambda \ell_1 + \cos \lambda \ell_1) + C_{2,1} \lambda e^{\lambda \ell_1} (- \;\cdots\;) =$$

$$= -C_{1,2} \lambda e^{\lambda \cdot 0} (\sin \lambda \cdot 0 + \cos \lambda \cdot 0) + C_{2,2} \lambda e^{\lambda \cdot 0} (\;\cdots\;)$$

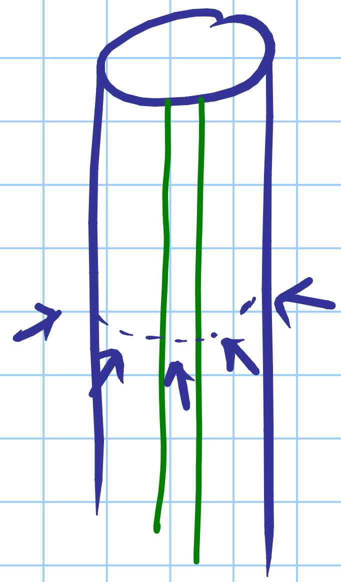
$$C = \begin{bmatrix} c_{1,1} \\ c_{2,1} \\ \\ \\ c_{4,4} \end{bmatrix}$$

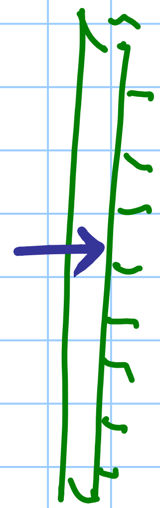
$$A \cdot C = B$$

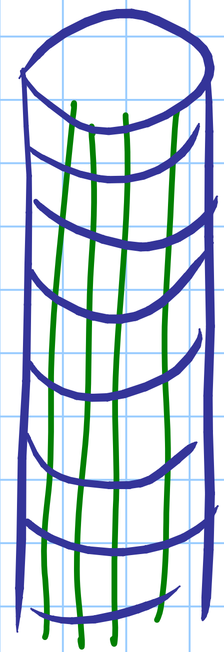
$$C = A^{-1} \cdot B$$

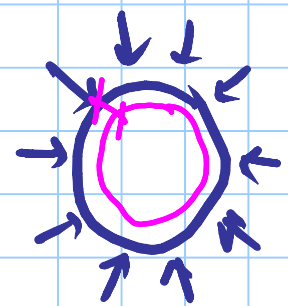


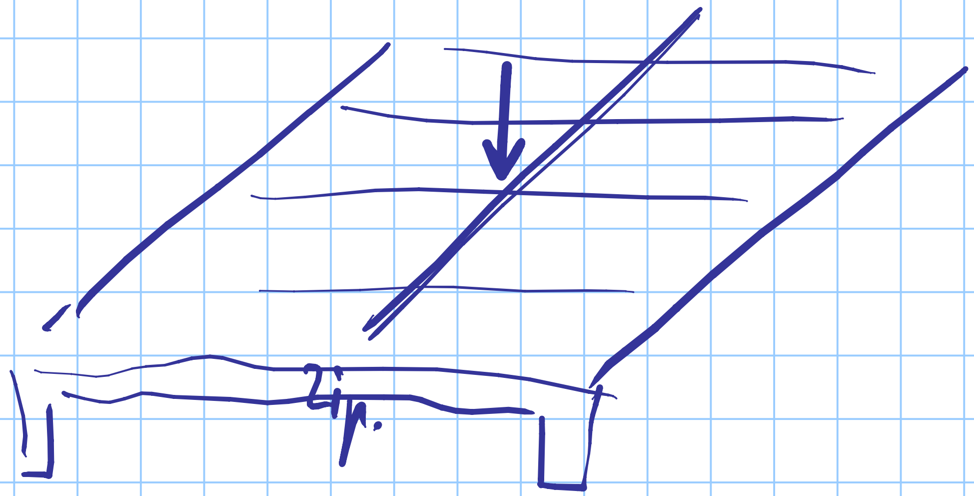
q
A
E
B
C
D
A=0

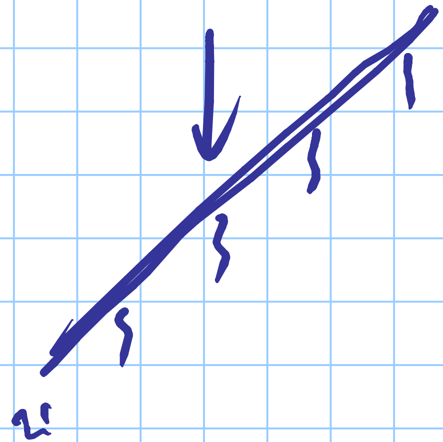


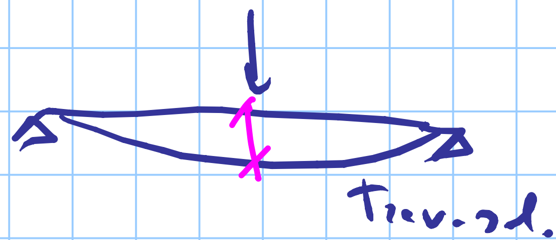






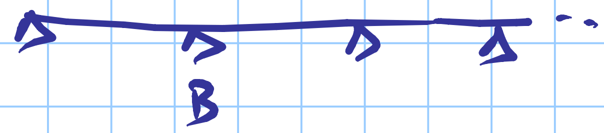






NON C'ENTRA CON LE FONDAZIONI

TRAVE – stima di M^-



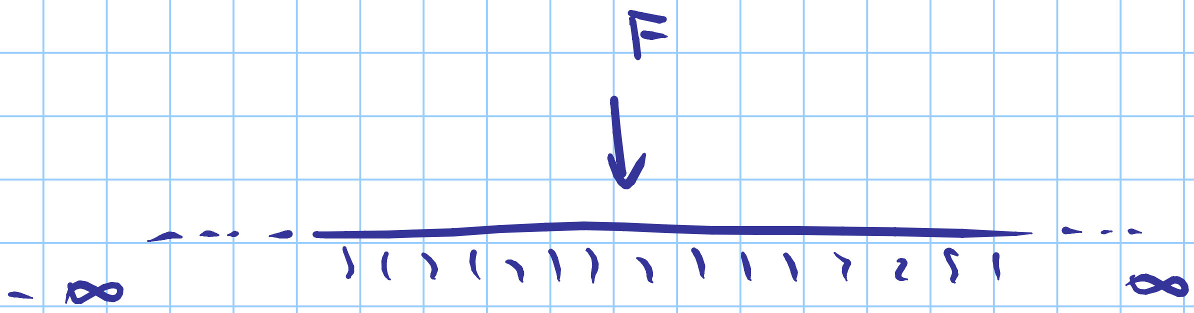
stimare $M^-_B = \dfrac{\frac{ql^2}{8} + \frac{ql^2}{12}}{2}$

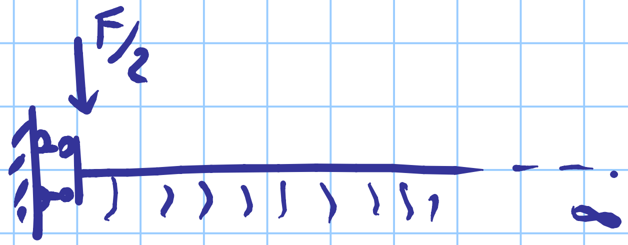
stiamo pensando a CROSS

la formula vale solo se $\rho_{B,s} = \rho_{B,d}$

se $\neq$ $\dfrac{ql^2}{8} - \dfrac{ql^2}{12}$ ripartita in funzione di ρ sommando al valore di partenza

FINE DIVAGAZIONE





$C_3 = C_4 \Longleftarrow \varphi(0) = 0$

$v(\infty) = 0$

$V(0) = -\frac{F}{2}$

$\varphi(\infty) = 0$

$\Downarrow$

$$C_3 = \frac{F}{8\lambda^3 EI}$$

$C_1 = 0 \qquad C_2 = 0$

$$v = \frac{F}{8\lambda^3 EI} e^{-\lambda z} (\sin \lambda z + \cos \lambda z)$$

$$\frac{F}{8\lambda^3 EI} \frac{\cdot \lambda}{\lambda}$$

$$A_{\lambda z} = e^{-\lambda z} (\sin \lambda z + \cos \lambda z)$$

$$B_{\lambda z} = e^{-\lambda z} \sin \lambda z$$

$$C_{\lambda z} = e^{-\lambda z} (\sin \lambda z - \cos \lambda z)$$

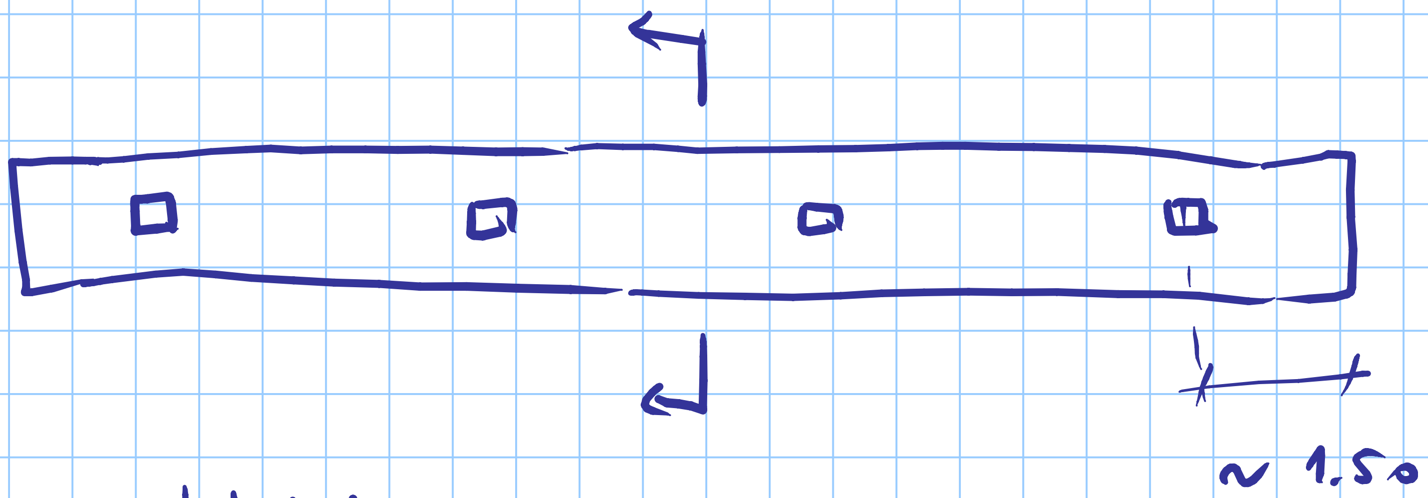
$$D_{\lambda z} = e^{-\lambda z} \cos \lambda z$$

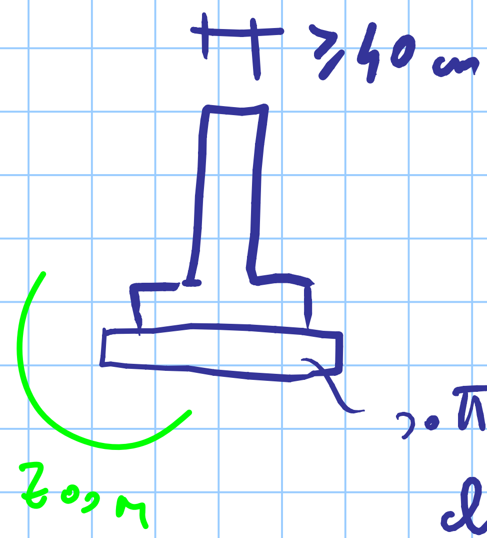
$$\sigma = \frac{F\lambda}{2Kb} A_{\lambda z}$$

$$\varphi = \frac{F\lambda^2}{Kb} B_{\lambda z}$$

$$M = -\frac{F}{4\lambda} C_{\lambda z}$$

$$V = -\frac{F}{2} D_{\lambda z}$$

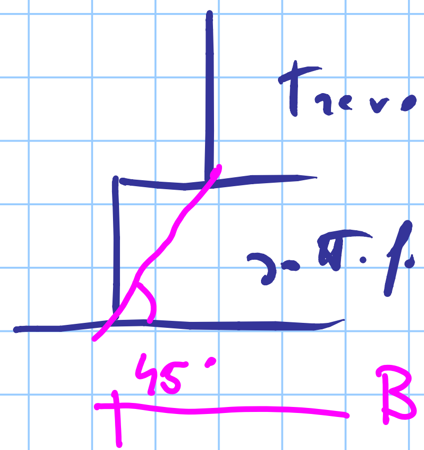




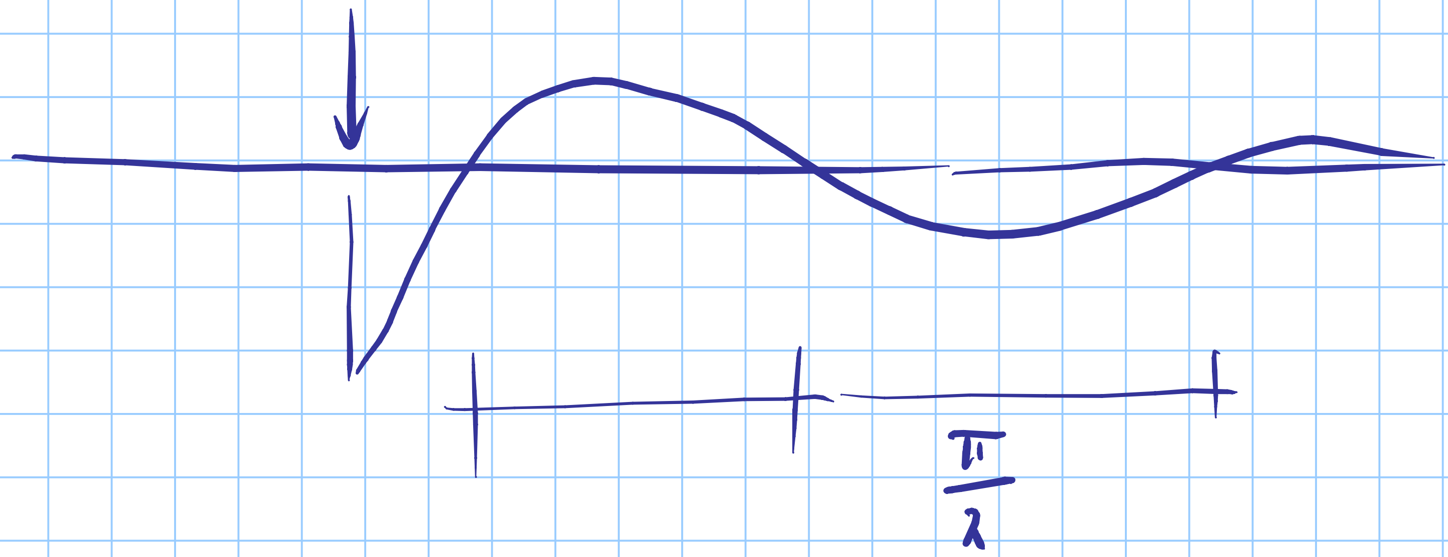
sottofondazione

cls meno buono

e senza armatura



M



dimensionamento

1) $V_{Ed} = 0.6\,F \le V_{Rd,max}$ $\quad \cot\theta = 2.5$

2) $I_{t,f} \gg I_{t,el.}$

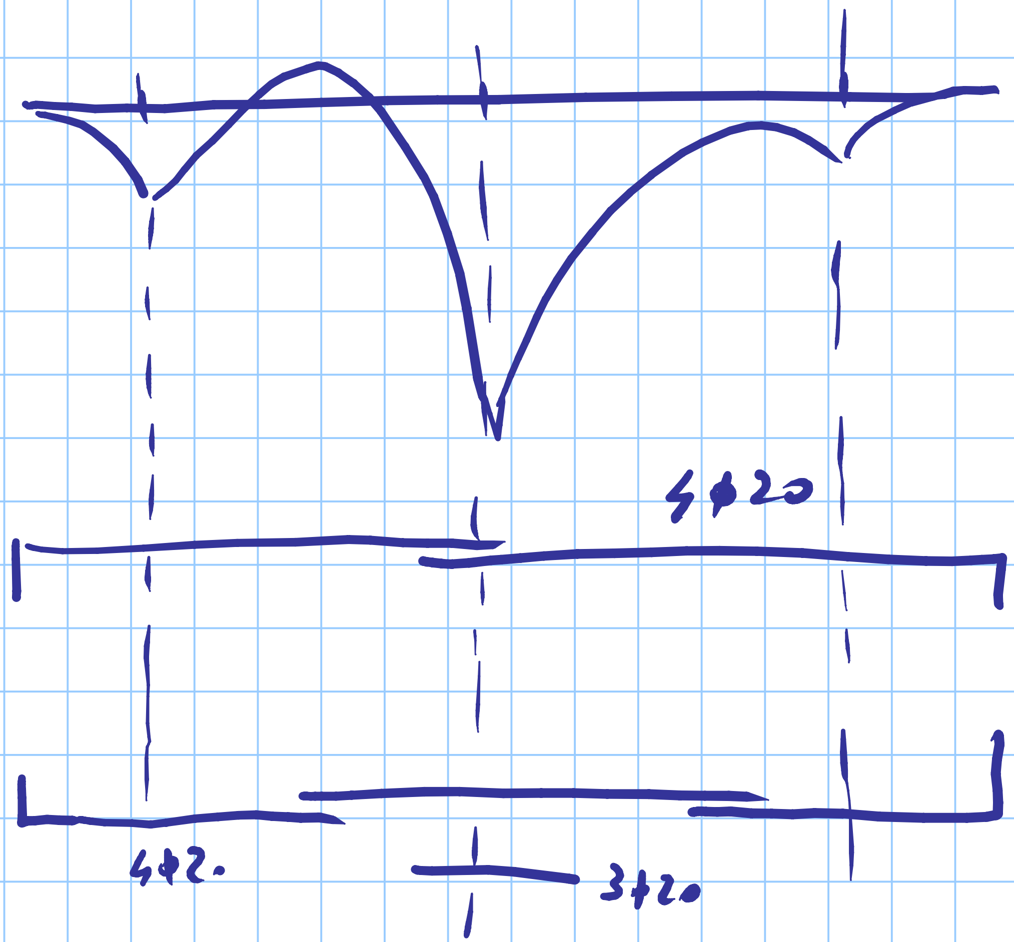
$$I_{t,f} \geq 4\, n\, I_{t,el}$$

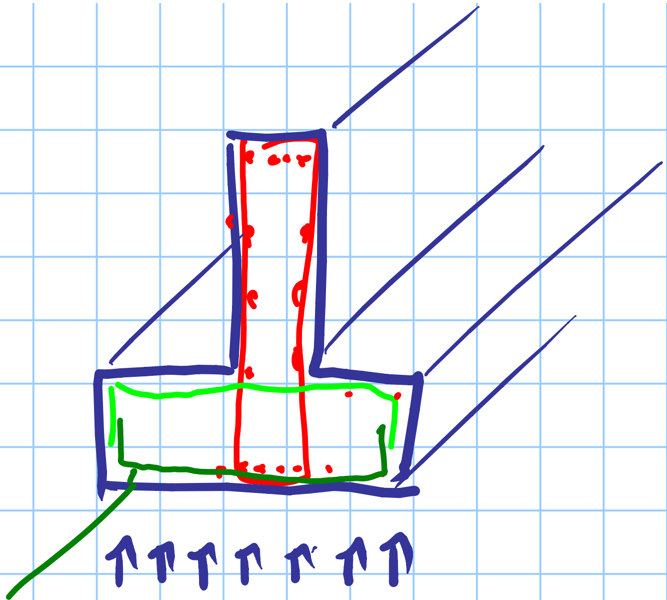
n = numero piani

$$\lambda = \sqrt[4]{\frac{K\, b}{4 E\, I_{t,f}}}$$

usare 2 valori nettamente distinti

es. facendo variare K da 1 a 5


4φ20
4φ20
3φ20



armatura

Ten