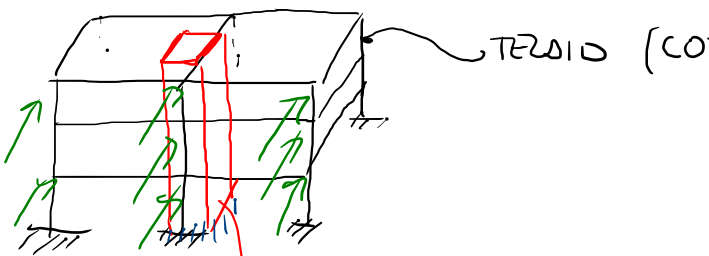
PROBLEMA DI RIPARTIZ. DELLE AZIONI ORIZZONTALI TRA UN TELAIO E UNA MENSOLA IRRIGIDENTE (CONTROVENTO)

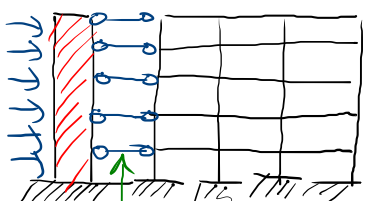
MODELLO SEMPLIFICATO ⇒ EDIFICI "ALTI"



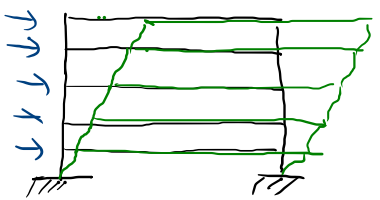
TELAIO (COMPORTAMENTO "A TAGLIO")

BLOCCO ASCENSORI
NUCLEO DI CONTROVENTO
(RESISTE ALLE AZ. ORIZZ.)
(COMPORTAMENTO "FLESSIONALE")

} COME LE AZIONI ORIZZONTALI (VENTO, SISMA) SI RIPARTISCONO TRA I DUE ELEMENTI STRUTTURALI



QUALI FORZE VENGONO TRASMESSE INTERNAMENTE ?



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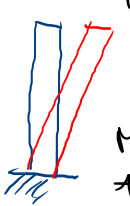
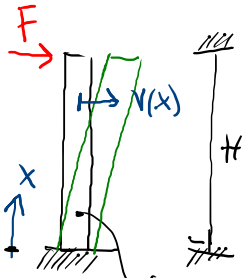


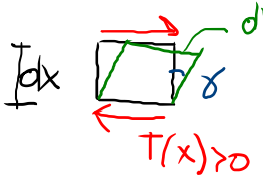
MENSOLA A DEFORMABILITÀ TAGLIANTE

MENSOLA DEFORMABILE A TAGLIO



T: cost. $\quad GA_{eq}$

CONCIO ELEMENTARE



SCORRIMENTO

$$\gamma = \frac{T}{GA_{eq}} = \frac{kT}{GA}$$

k: FATTORE DI TAGLIO > 1 $\quad \frac{6}{5}$: ▨ ; $\frac{32}{27}$: ●

$T = +F$

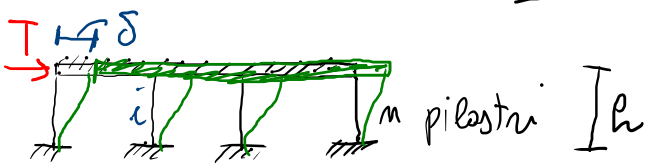
$$\Rightarrow \boxed{\frac{dV}{dx} = \frac{T(x)}{GA_{eq}}(x)}$$

EQ. DIFFERENZ. I ORDINE

$$\begin{cases} \frac{dV}{dx} = \frac{T}{GA_{eq}} \\ V(0) = 0 \end{cases} \quad \begin{cases} \frac{dV}{dx} = +\frac{F}{GA_{eq}} \\ V(0) = 0 \end{cases} \Rightarrow V(x) = \frac{F}{GA_{eq}}x + C \Rightarrow \boxed{V(x) = \frac{F}{GA_{eq}}x} \Rightarrow V(H) = \frac{F}{GA_{eq}}H$$

$C = 0$

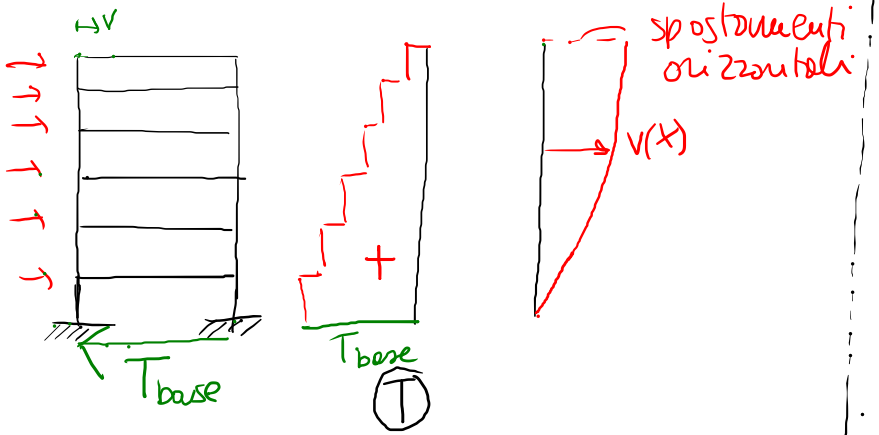
ASSEGNATO UN TELAIO $\Rightarrow$ GA_{eq} ?



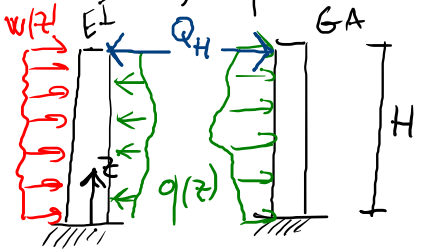
$$\delta = \frac{T h^3}{12 \sum_{i=1}^{m} EI_i}$$

$$GA_{eq} = \frac{12 \sum_{i=1}^{m} EI_i}{h^2}$$

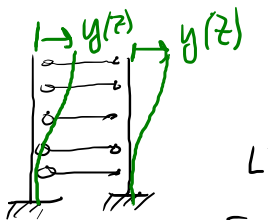
$$tg\alpha \simeq \alpha = \frac{\delta}{h} \; ; \; \alpha = \frac{\delta}{h} = \frac{T h^2}{12 \sum_i EI_i} \frac{1}{GA_{eq}}$$



IPOTESI ; LE DUE MENSOLE SI SCAMBIANO AZIONI INTERNE IN MANIERA "DIFFUSA" (NON DISCRETA) $q(z)$. INOLTRE È PRESENTE ANCHE LA FORZA CONCENTR. Q_H

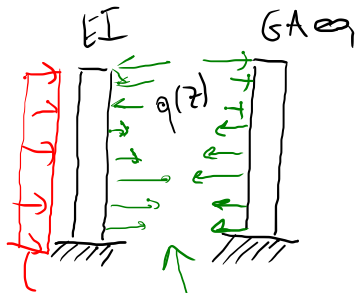


DAL PUNTO DI VISTA CINEMATICO, LE DUE MENSOLE SI SPOSTANO CON LA STESSA FUNZIONE $y(z)$ (PER CONGRUENZA)



LE "GRANDI" INCOGNITE DEL PROBLEMA SONO $y(z), q(z), Q_H$

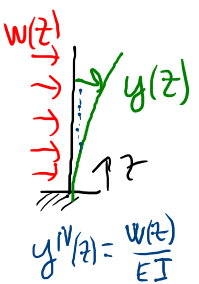
RITORNO AL PROBLEMA PRINCIPALE



FORZE INTERNE DISTRIBUZ. NON LINEARE (È NON BANALE)

VEDI POZZATI, vol 2^1, vol 2^2

MENSOLA (EI)



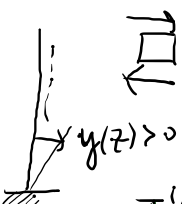
$$y''(z) = -\frac{M(z)}{EI}$$

$$M'(z) = T(z)$$

$$y'''(z) = -\frac{T(z)}{EI}$$

$$y^{IV}(z) = \frac{w(z)}{EI}$$

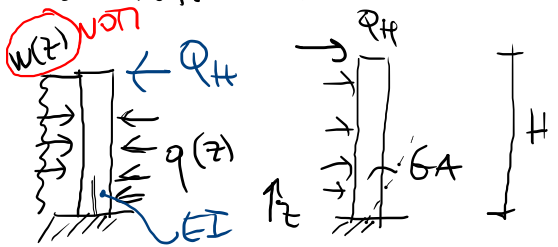
MENSOLA (GA)



$$y'(z) = \frac{T}{GA}(z)$$

$$T'(z) = -q(z) \Rightarrow GAy''(z) = -q(z)$$

DETERMINAZ. DEL MODELLO STRUTTURALE



$$EI\,y^{IV}(z) = w(z) - q(z)$$

$$EI\,y^{IV}(z) + q(z) = w(z)$$

$$\boxed{EI\,y^{IV}(z) - GA\,y''(z) = w(z)}$$

EQ DELLA LINEA ELASTICA "MODIFICATA" (IV ORDINE)

$$y^{IV}(z) - \underbrace{\frac{GA}{EI}}_{\alpha^2} y''(z) = \frac{w(z)}{EI}$$

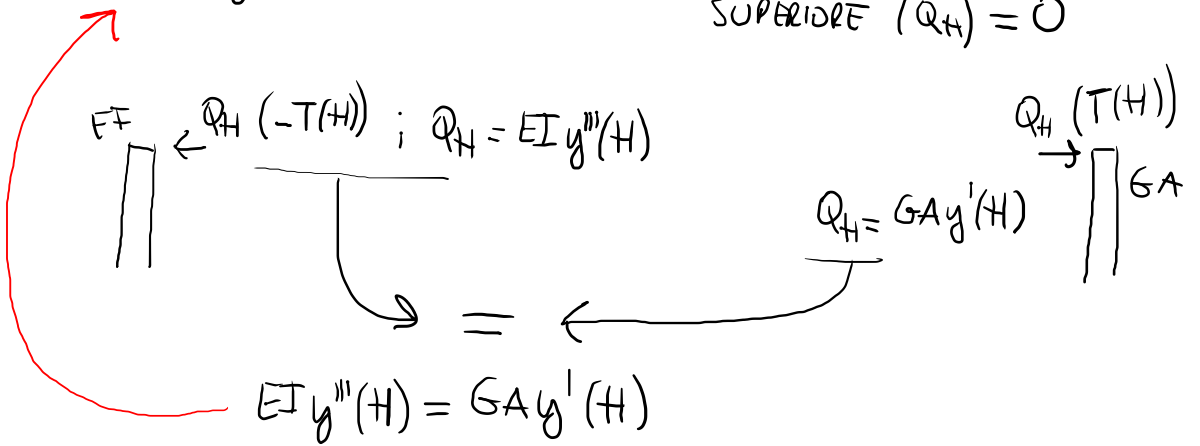
CONDIZ. AI LIMITI (4!)

① $y(0) = 0$; ② $y'(0) = 0$ (MENSOLA FLESSIONATE)

③ $-EI\,y''(H) = 0$; ASSENZA DI MOMENTI CONCENTRATI ALL'ESTR SUP. DELLA MENS. FLESSIONALE

④ $-EI\,y'''(H) + GA\,y'(H) = 0$

SOMMA DELLE FORZE ALL'ESTR. SUPERIORE $(Q_H) = 0$



$[\alpha] = [L^{-1}]$ ⟹ αH : ADIMENSIONALE

UN INTEGRALE (NEL CASO DI $w(x)=w$ COST.) È IL SEGUENTE

$$y(z) = \underbrace{C_1 + C_2 z + C_3 \cosh \alpha z + C_4 \sinh \alpha z}_{\text{generale}} \underbrace{- \frac{w z^2}{2EI\alpha^2}}_{\text{particolare}}$$

$$\left[\frac{w z^2}{EI \alpha^2}\right] = \left[\frac{\frac{F}{L} L^2 \frac{1}{\cancel{L^2}} \cancel{L^2}}{}\right] = [L]$$

$C_1, C_2, C_3, C_4 \Rightarrow$ 4 CONDIZ. PAG. PRECEDENTI

RIGA PITOCCAMO: NOTA LA SOLUZ. $y(z)$ DEL MIO PROBLEMA

MENSOLA EI

$EI\, y''(z) = -M(z)$: MOM. FLETTENTE

$EI\, y'''(z) = -T(z)$: TAGLIO

$EI\, y'''(H) = Q_H$ FORZA IN SOMMITA'

MENSOLA GA

$GA\, y'(z) = T(z)$ TAGLIO

$GA\, y'(H) = Q_H$ FORZA IN SOMMITA'

$GA\, y''(z) = -q(z)$ AZIONI SCAMBIATE DALLE DUE MENSOLE