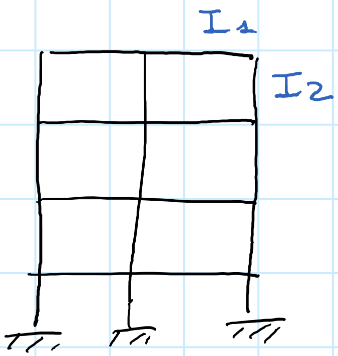
CONSIDERAZIONI PROGETTUALI (ELEMENTI PRESSO-INFLESSI)

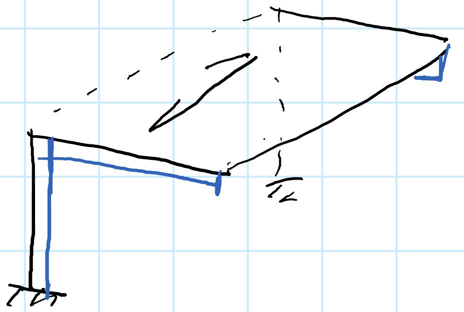
- NEL CASO DI STRUTTURE MOLTO IPERSTATICHE

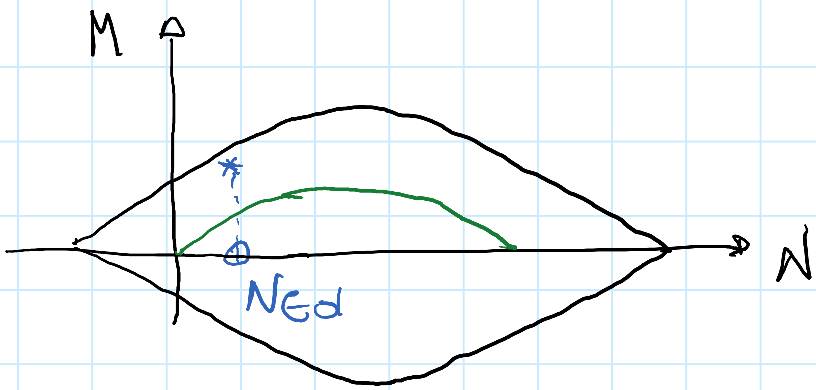


M_{Ed} DIPENDE DA I_1, I_2

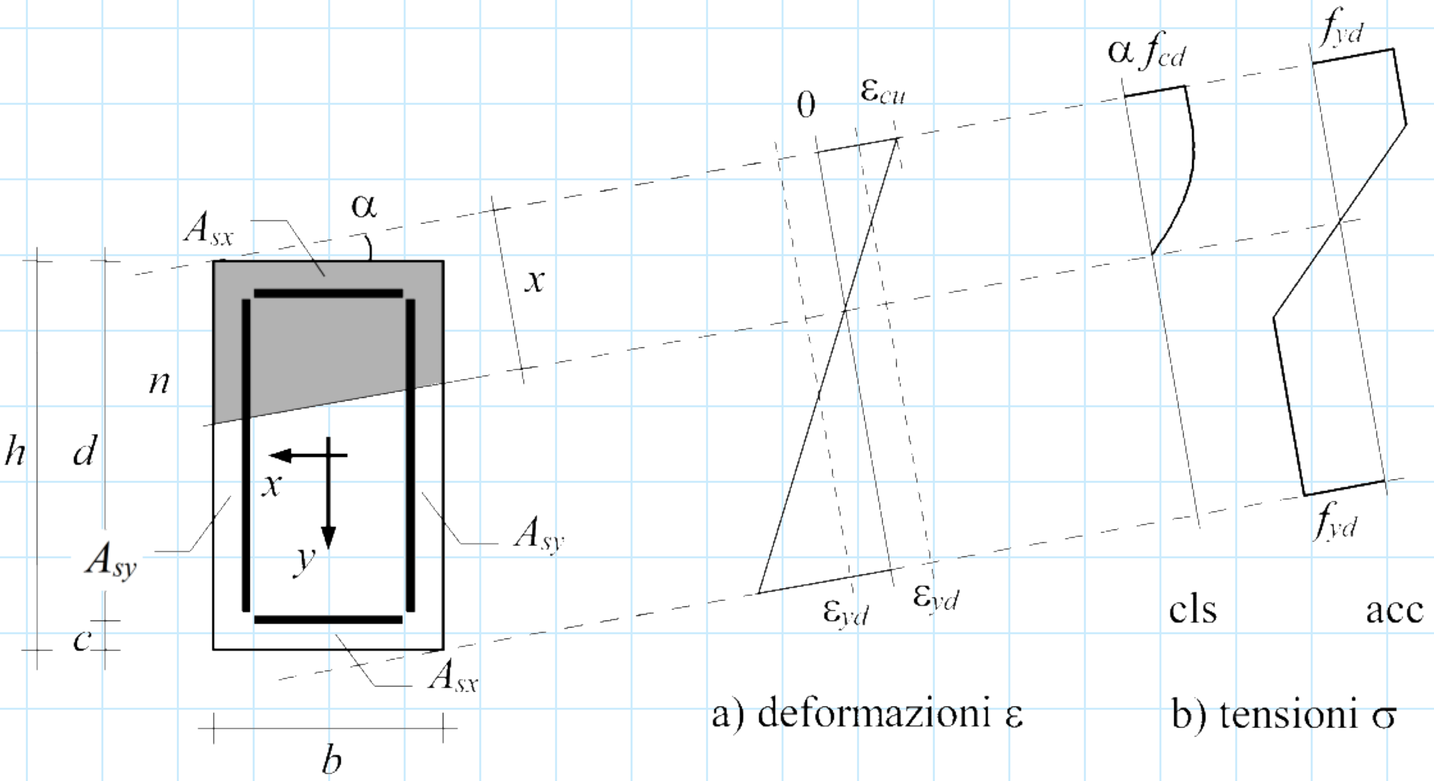
→ PREFERIBILE PROGETTARE PER $N^*_{Ed} > N_{Ed}$
(GARANTISCO CAPACITÀ DI PORTARE M_{Ed})

- PER STRUTTURE ISOSTATICHE (M_{Ed}, N_{Ed} NOTE) E BASSE
  - PROGETTO b, h A FLESSIONE (CAUTELATIVO SE N_{Ed} È BASSO)
  - CALCOLO $M_{Rd,cls}(N_{Ed})$
  - PROGETTO A_s PER PRESSO-FLESSIONE



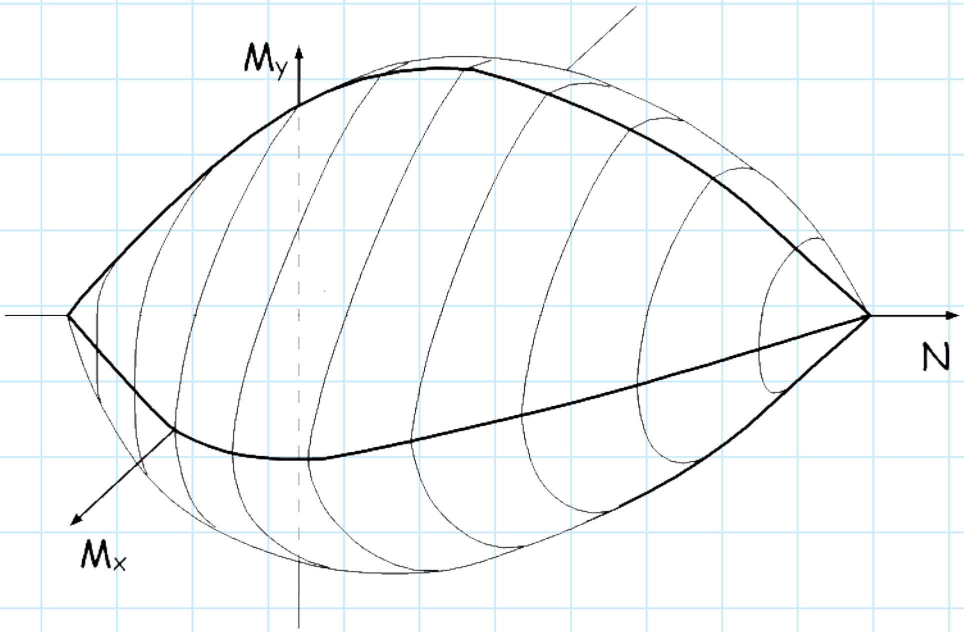


PRESSO FLESSIONE DEVIATA



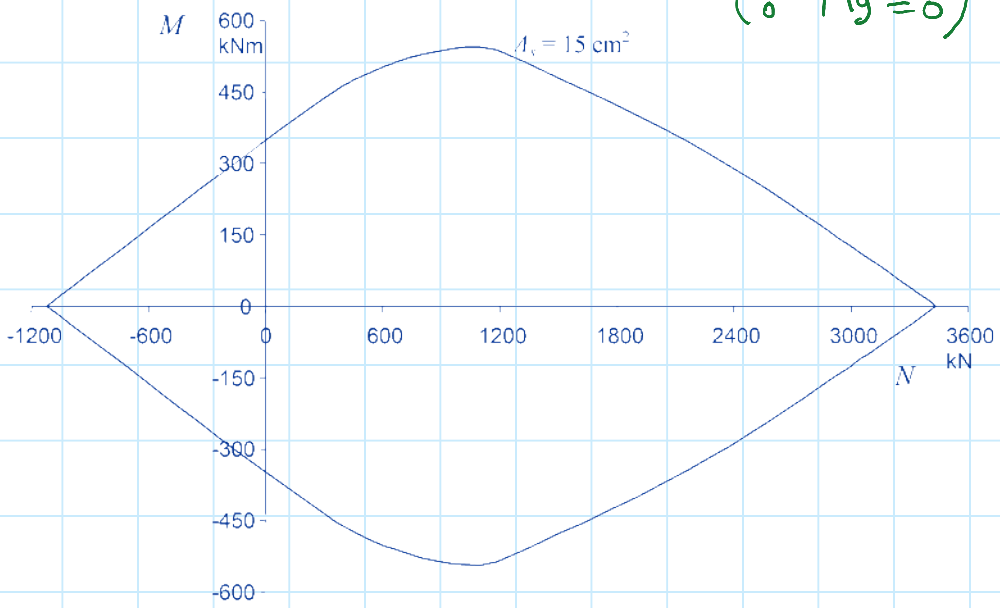
- PER COSTRUIRE IL DOMINIO M_x, M_y, N CONSIDERO
  - INFINITE INCLINAZIONI DELL' ASSE NEUTRO
  - INFINITI DIAGRAMMI DI DEFORMAZIONE LIMITE

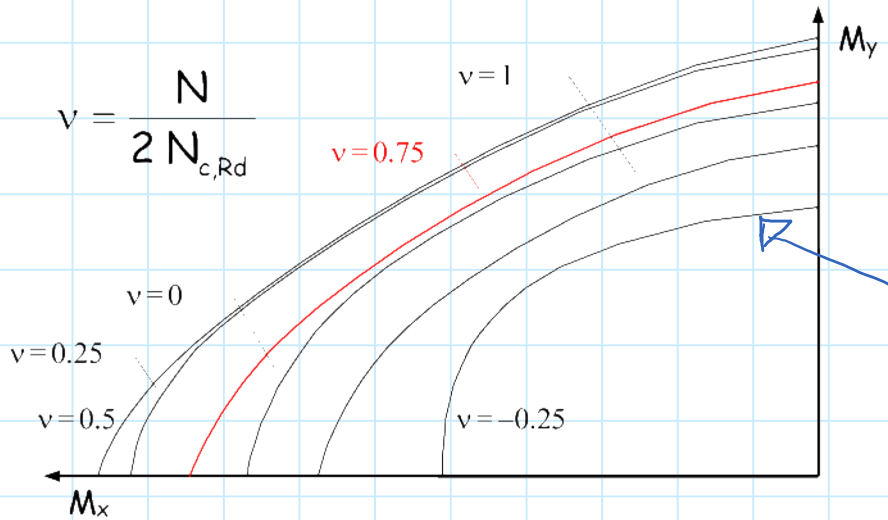
DOMINIO ALLO SLU



SEZIONE NEL PIANO $M_x = 0$

(o $M_y = 0$)





SEZIONI NEL PIANO

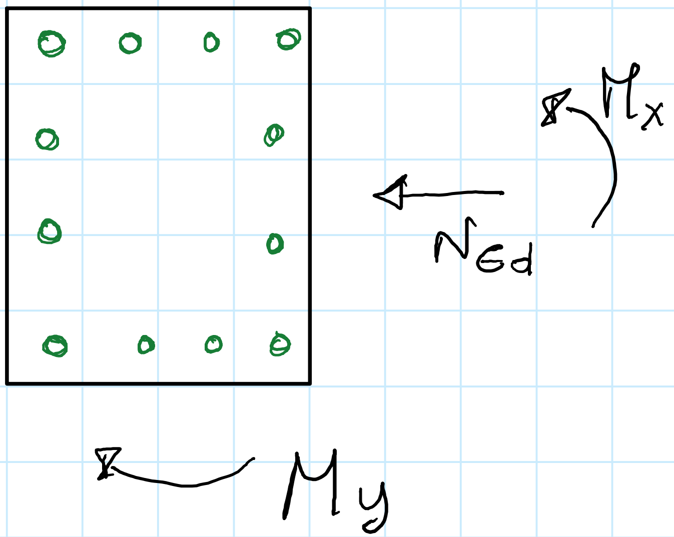
$N = \bar{N}$

EQUAZIONE DEL TIPO

$$\left(\frac{M_x}{M_{x,Rd}(N)}\right)^p + \left(\frac{M_y}{M_{y,Rd}(N)}\right)^q = 1$$

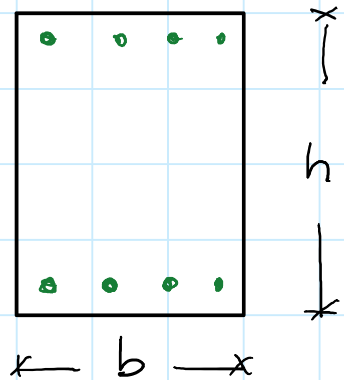
CAUTELATIVO $p = q = 1.5$

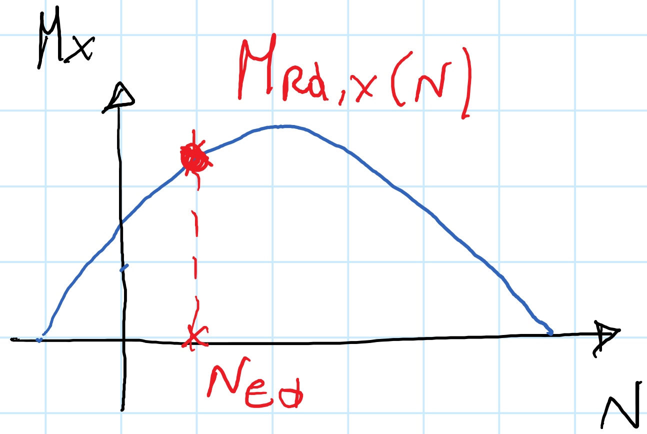
PROCEDIMENTO DI VERIFICA



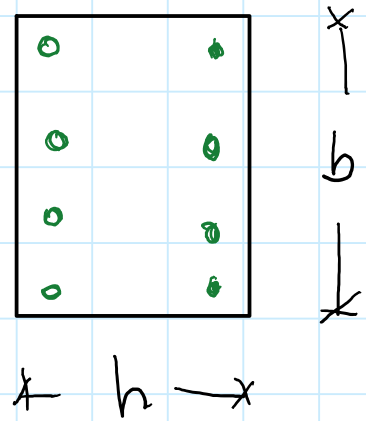
CONSIDERO SEPARATAMENTE 2 CASI DI PRESSO-FLESSIONE RETTA

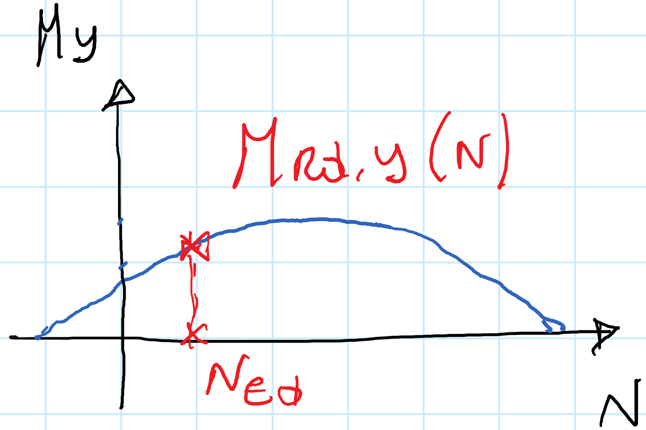
1.





2.





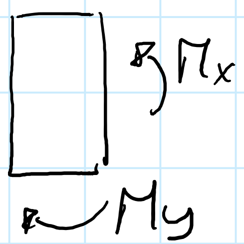
VERIFICA SODDISFATTA SE:

$$\left(\frac{M_x}{M_{Rd,x}}\right)^{1.5} + \left(\frac{M_y}{M_{Rd,y}}\right)^{1.5} \leq 1$$

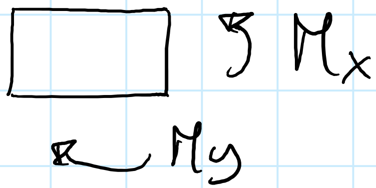
PROCEDIMENTO DI PROGETTO

1. DIMENSIONAMENTO DELLA SEZIONE

SE $M_x \geq M_y$

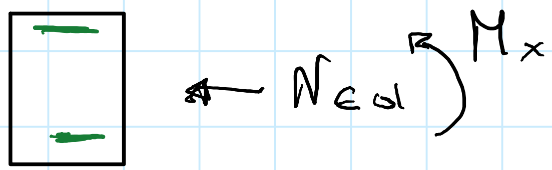


SE $M_y \leq M_y$



2. PROGETTO ARMATURE SU CIASCUN LATO

CONSIDERANDO M_{ED} N_{Ed}



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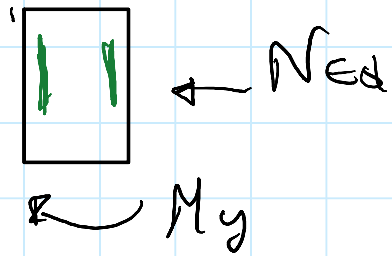
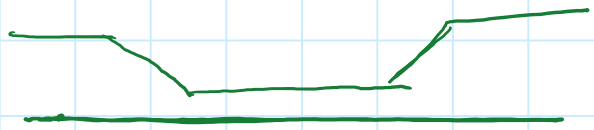
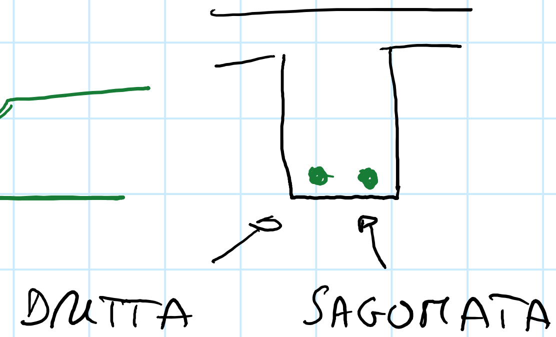


PROGETTO ARMATURE SOLAIO 2 TRAVETTI AL METRO

$$A_s = \frac{M_{Ed}}{0{,}9\, d\, f_{yd}} \cdot \frac{1}{N_{TRAVETTI}}$$

1. CALCOLO ARMATURE IN CAMPATA
   (ALMENO 2 BARRE)



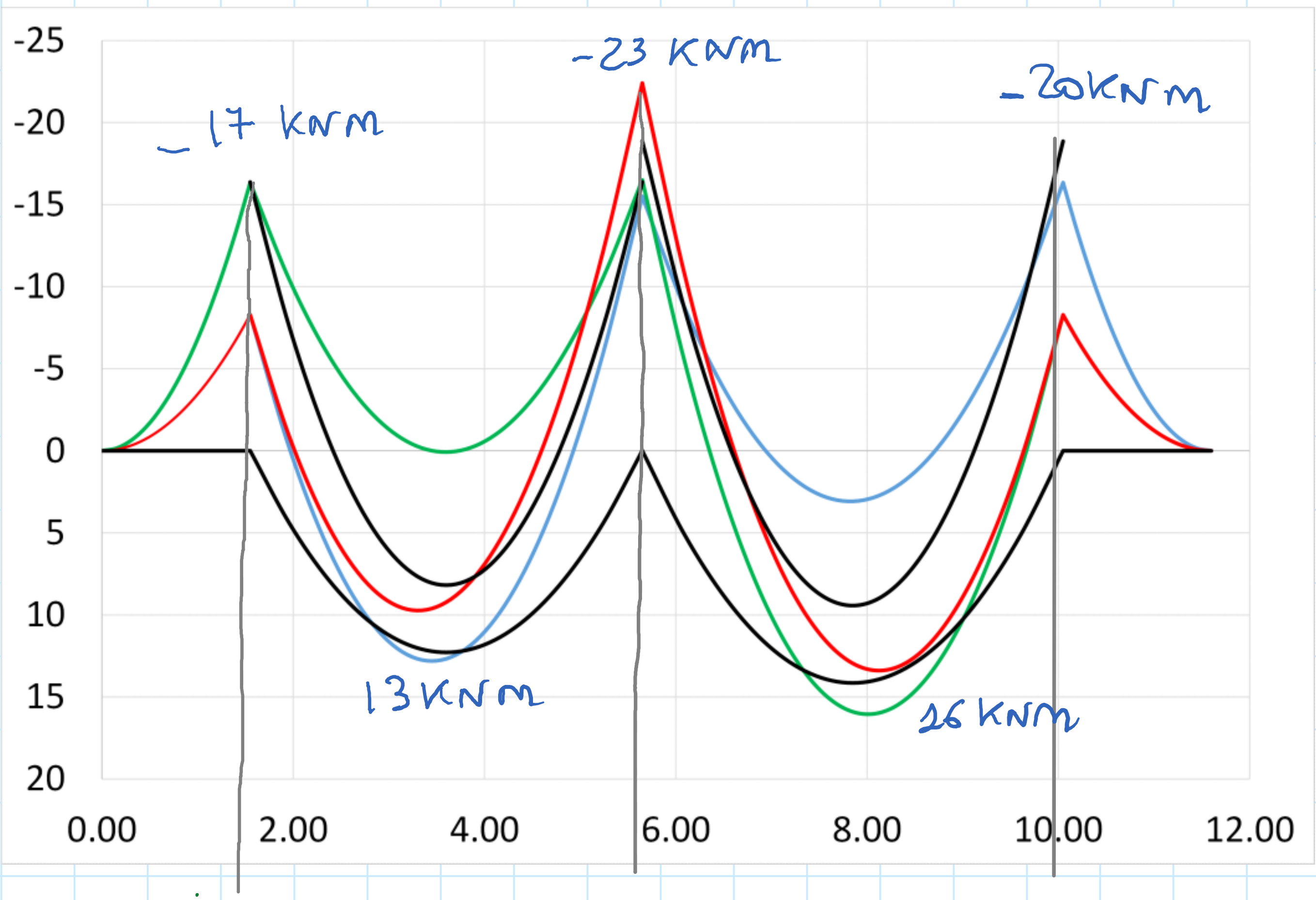


2. ARMATURA SAGOMATA
   DIVENTA ARMATURA SUPERIORE AGLI
   APPOGGI

3. CALCOLO ARMATURA AGLI APPOGGI COME

$$A_s = A_{s\,NEC} - A_{SAGOMATI}$$

ARMATURA 2 TR. METRO



1,2   1.62   1.42

0,91   1.14

($1\phi10 + 1\phi10$)   ($1\phi10 + 1\phi10$)

$\Rightarrow$

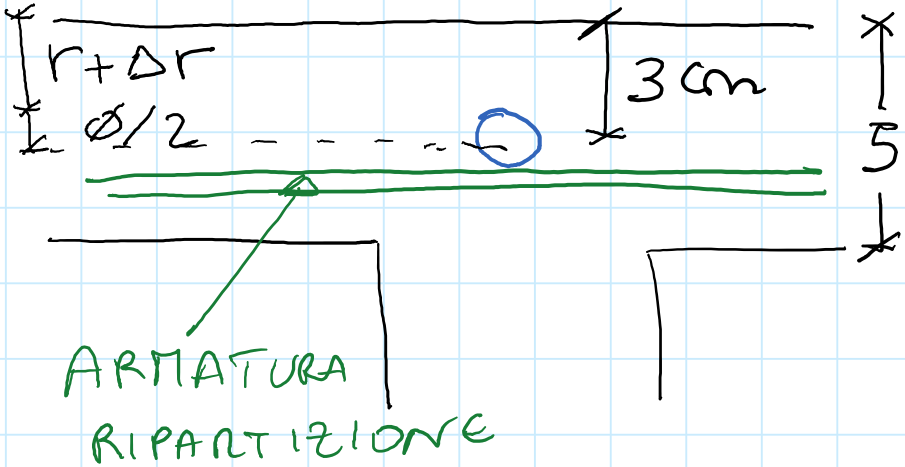
NELL' APPOGGIO CENTRALE HO

$1.62 - 1\phi10 - 1\phi10$

$\downarrow$

AGGIUNGO $1\phi10$

CONSIDERAZIONI SU ALTEZZA UTILE (ARM. SUPERIORE)

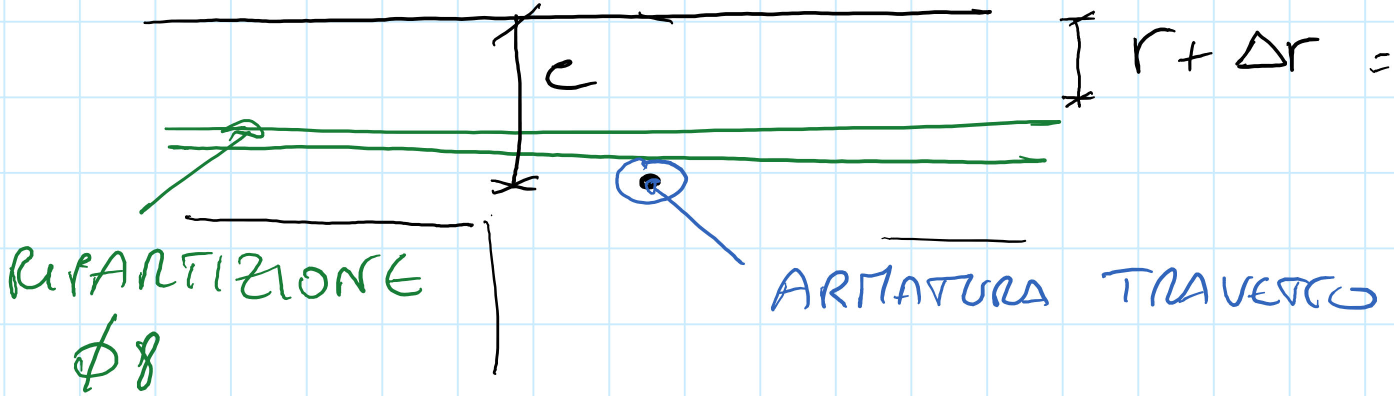


NEL CASO DI BARRE DRITTE

$$c = r + \Delta r + \frac{\phi}{2} =$$

$$= 2,5 + 0,5 = 3\,cm$$

NEL CASO DI BARRE SAGOMATE

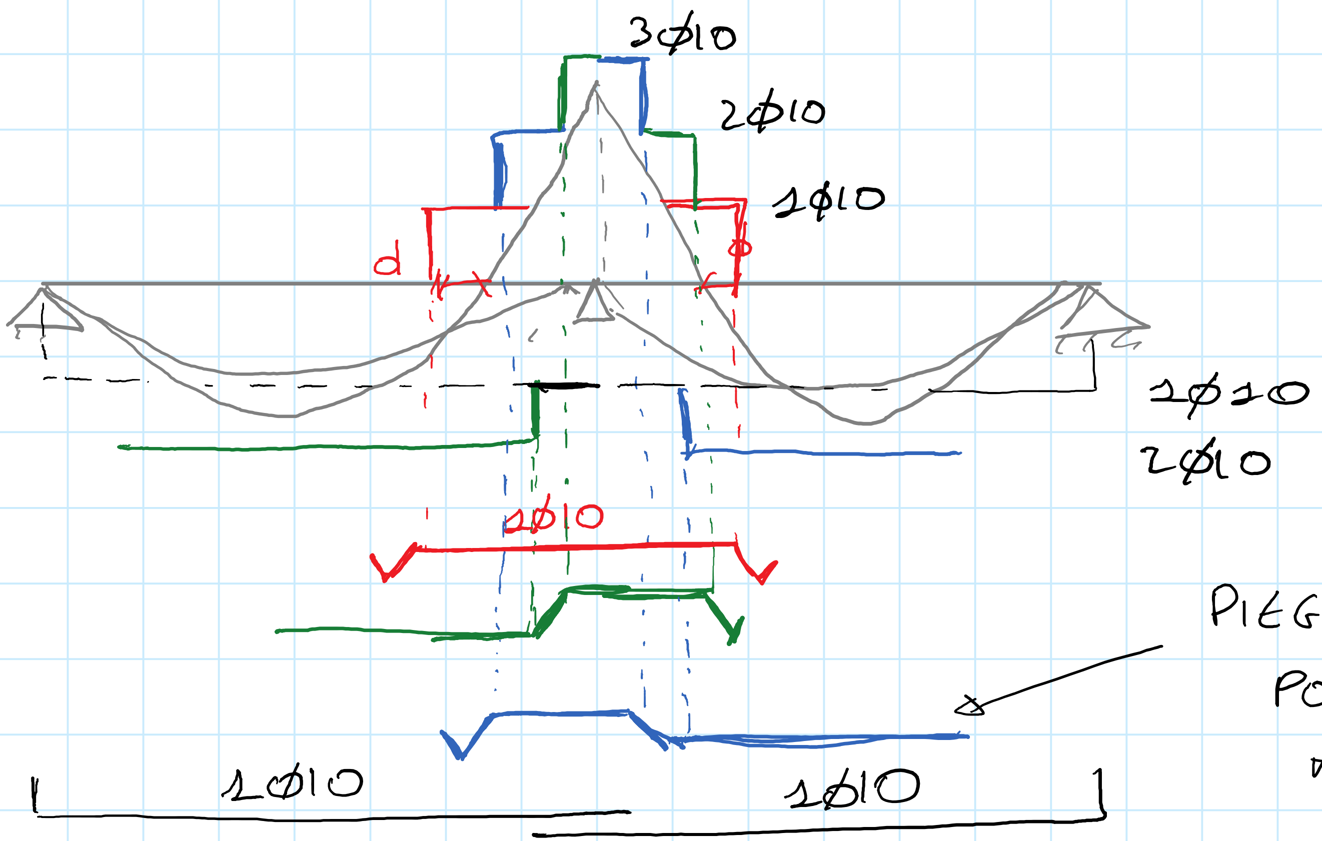


$r + \Delta r = 2,5\,cm$

$$c = 2,5 + 0,8 + \frac{\phi}{2}$$

$$\simeq 4\,cm$$

DISPOSIZIONE ARMATURE APPOGGIO CENTRALE



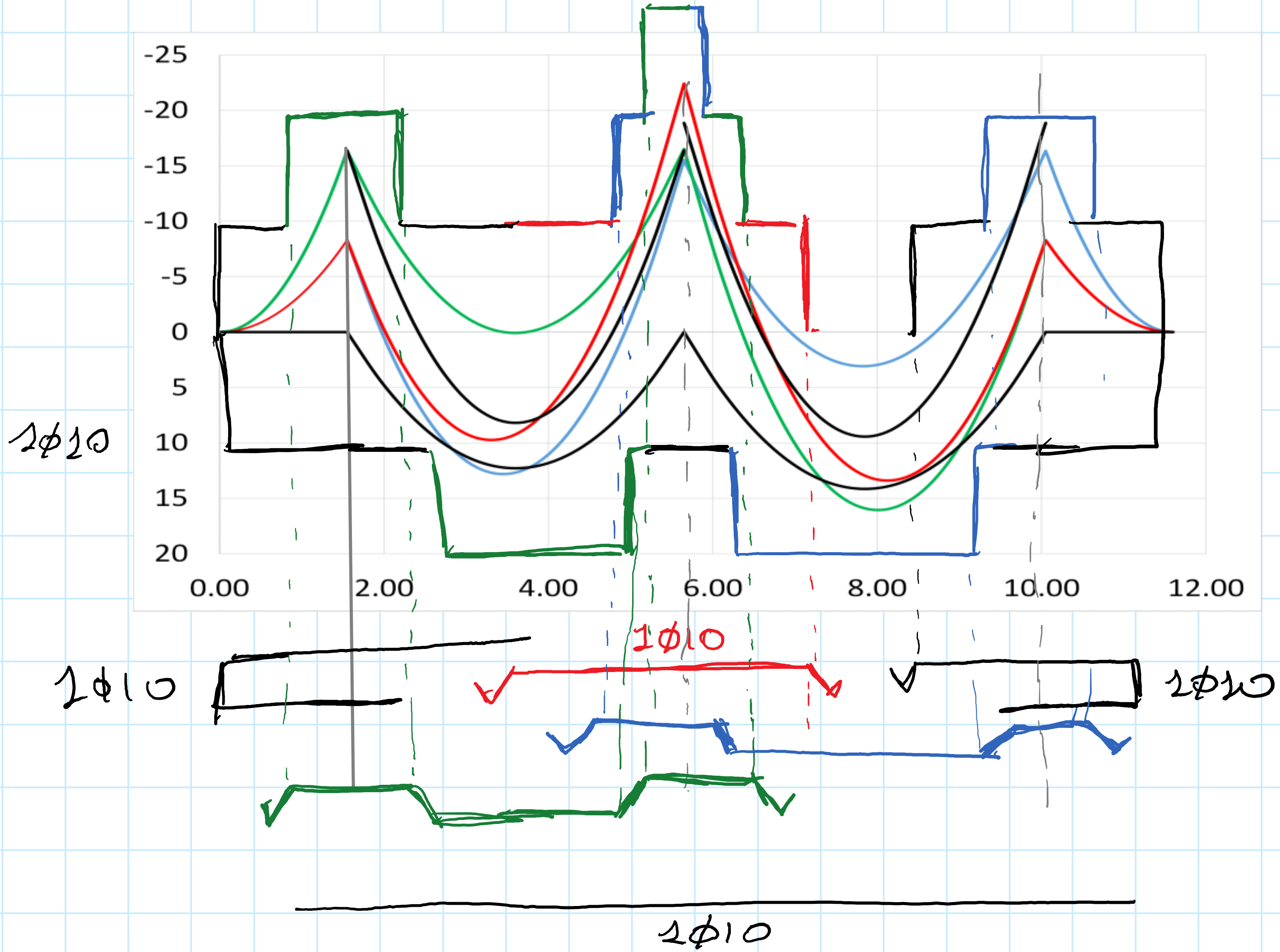
PIEGA PIÙ VICINO POSSIBILE AD APPOGGIO

BARRA DRITTA PER TUTTA LA CAMPATA

NEL NOSTRO CASO

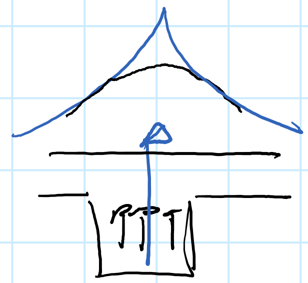
$$M_{Rd\,\phi 10} = 0.785\ cm^2 \times 2 \times 0{,}9 \times \underbrace{0{,}20}_{d}\ m \times 391.3 \frac{N}{mm^2} = 11\ KNm$$

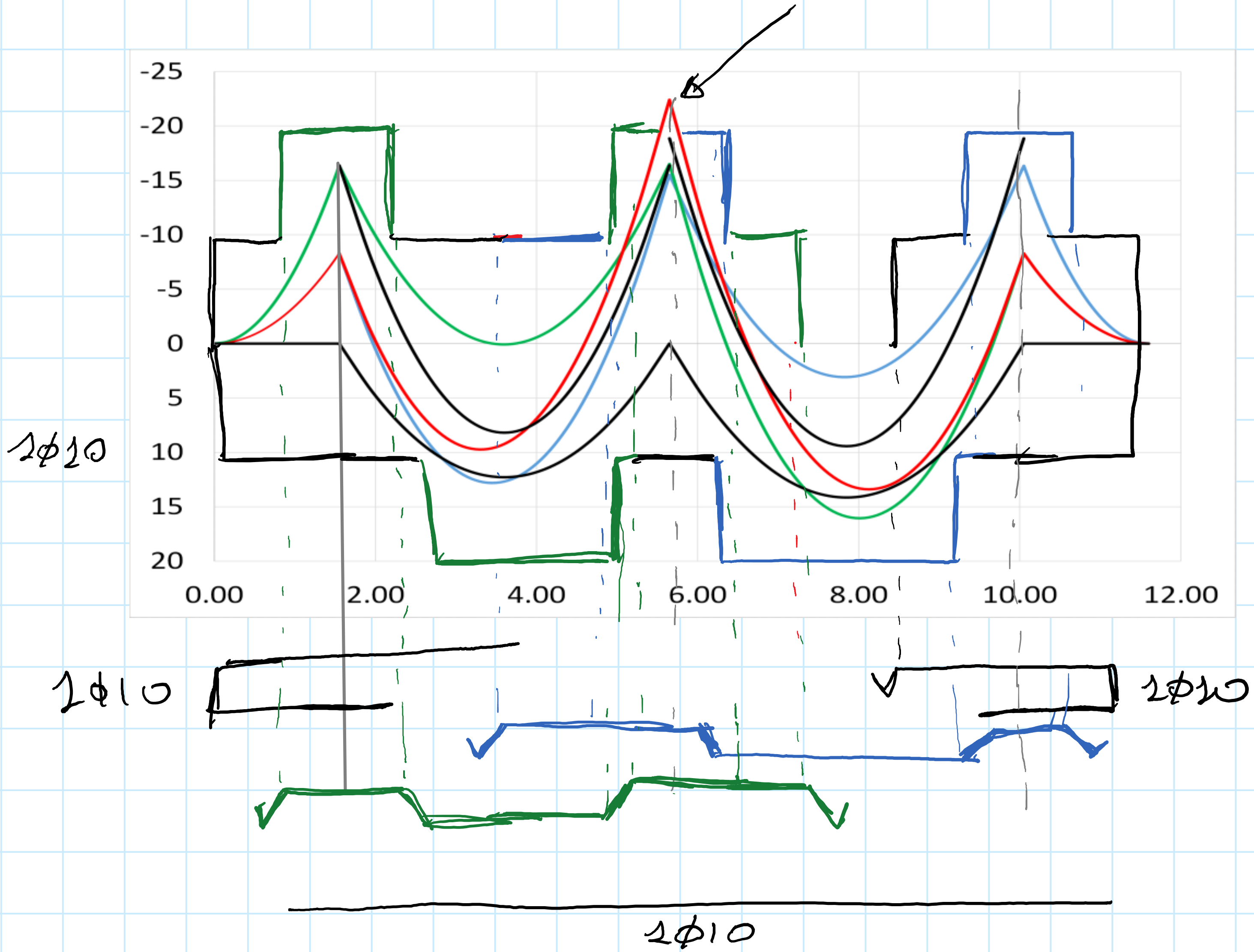
(SE $c = 4 \rightarrow d = 0{,}19 \rightarrow M_{Rd} = 10.5\ KNm$)



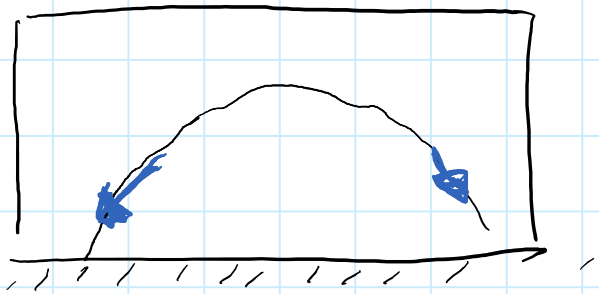
ALTRA SOLUZIONE POSSIBILE

POSSO SPUNTARE IL DIAGRAMMA

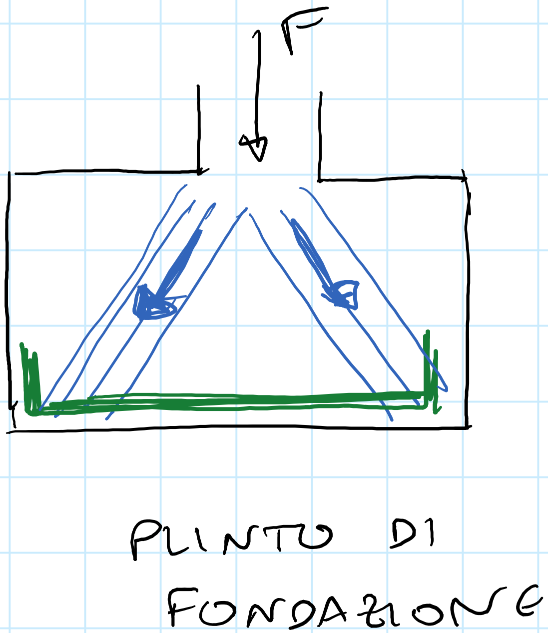




TAGLIO



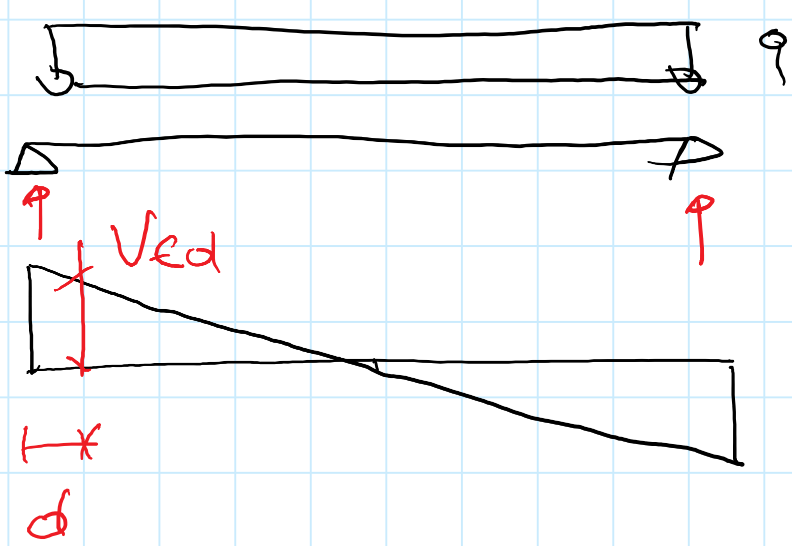
EFFETTO ARCO



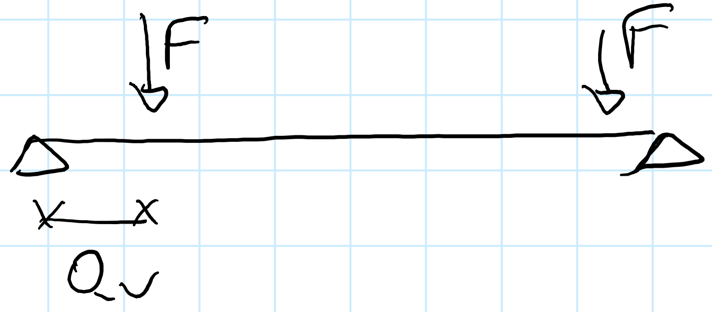
MODELLO STRUT & TIE

INDICAZIONI EC2 IN PROSSIMITÀ APPOGGI

CARICHI DISTRIBUITI

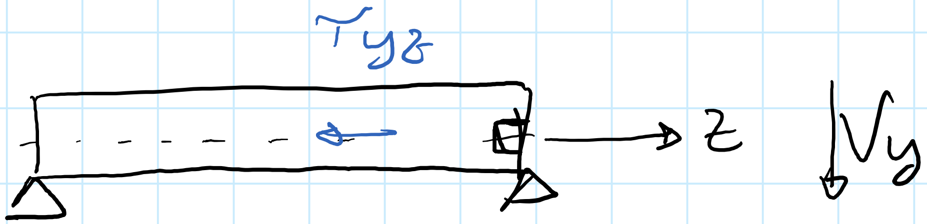


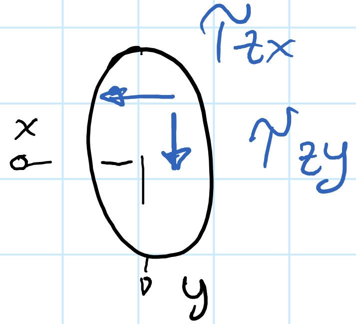
FORZE CONCENTRATE

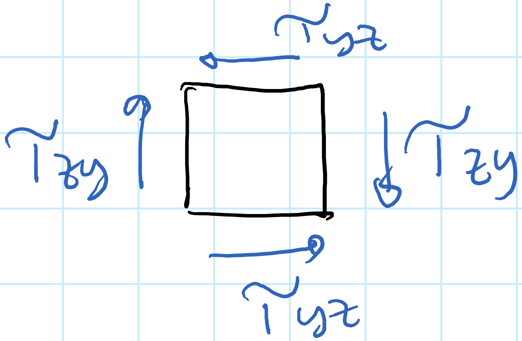


$$V_{Ed} = \frac{F \cdot a_v}{2d} \qquad a_v < 2d$$

TENSIONI TANGENZIALI





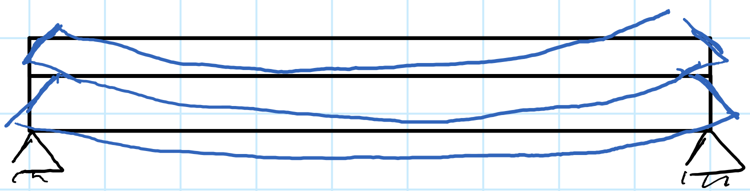


$\tau_{yz} = \tau_{zy}$

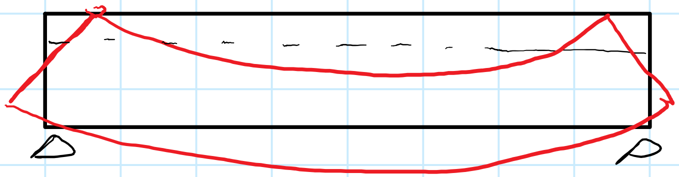
RISULTANTE $\tau_{zy} = V_y$

" $\tau_{zx} = 0$

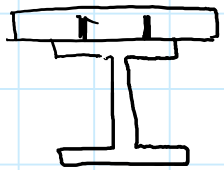
RISULTANTE (IN UN TRATTO) τ_{yz} = FORZA DI SCORRIMENTO



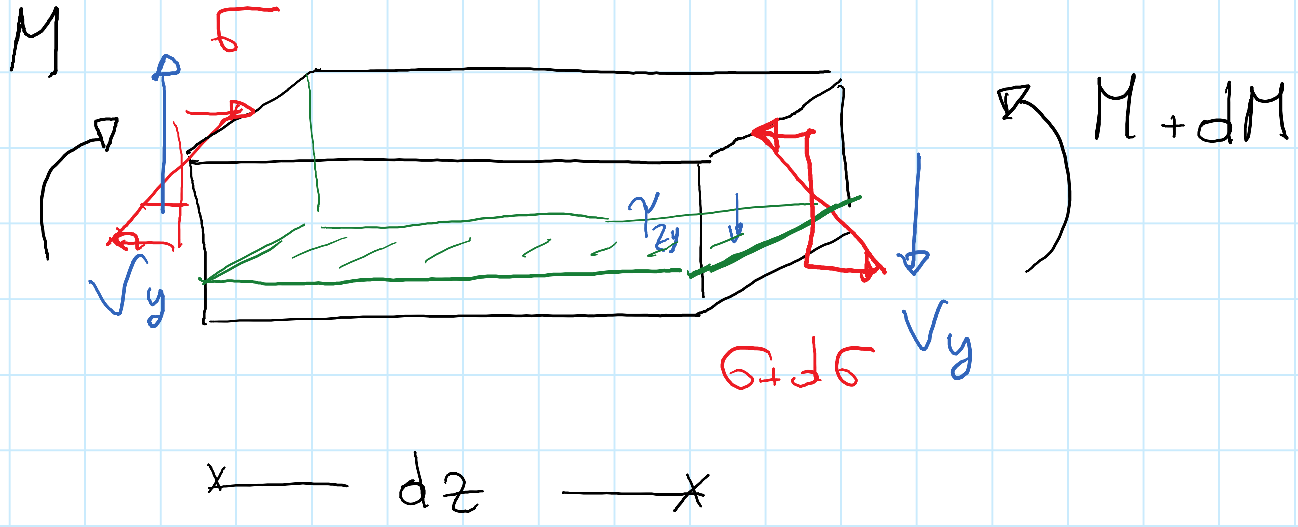
IN ASSENZA DI τ_{yz}



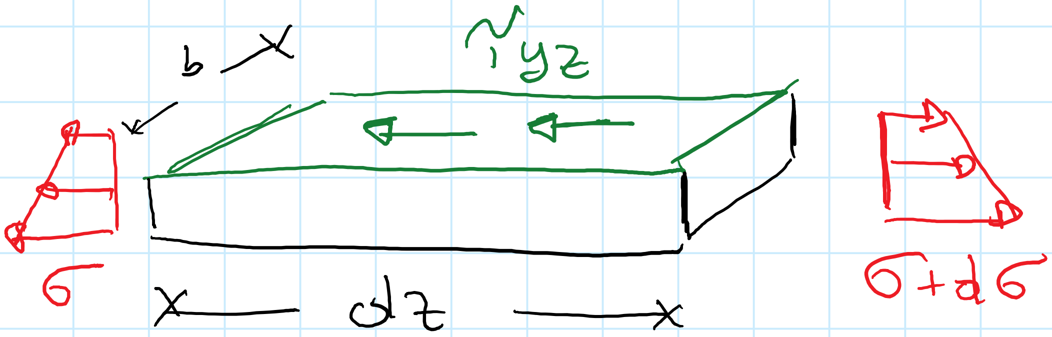
CON τ_{yz}



TRATTAZIONE JOURAWSKI (MATERIALE OMOG. ISOTR.)



$$V_y \cdot dz = dM$$



$$\sigma = \frac{M}{I} y$$

$$d\sigma = \frac{dM}{I} y$$

(y DISTANZA DA BARICENTRO)

EQUILIBRIO ALLA TRASLAZIONE

$$\cancel{\int_{A_{INF}} \sigma\, dA} + \underbrace{\tau_{yz}}_{\text{MEDIO}} \cdot b\,dz = \cancel{\int_{A_{INF}} \sigma\, dA} + \int_{A_{INF}} d\sigma\, dA$$

$$\tau_{yz} \cdot b\,dz = \int \frac{\overbrace{dM}^{V_y dz}}{I}\, y\, dA$$

$$\tau_{yz}\, b\,\cancel{dz} = \frac{V_y \cdot \cancel{dz}}{I} \underbrace{\int_{A_{INF}} y\, dA}_{S_{INF}} \longrightarrow$$

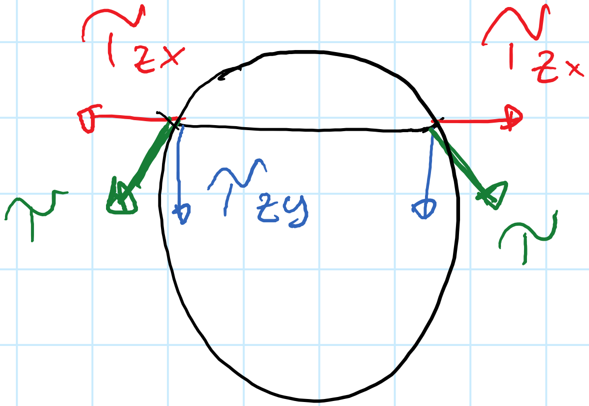
$$\tau_{yz} = \tau_{zy} = \frac{V_y\, S_{INF}}{I \cdot b}$$

NOTA BENE:

S_{INF}, I RISPETTO ASSE BARICENTRICO

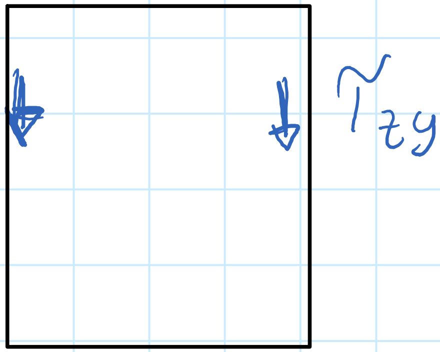
NELLA TRATTAZIONE APPROSSIMATA

τ_{zy} = COSTANTI LUNGO LA CORDA



CALCOLO τ_{zx} : τ // AL BORDO

τ_{zx} VARIA LINEARMENTE LUNGO LA CORDA



IN SEZ. RETTANGOLARE

$\tau_{zx} = 0$