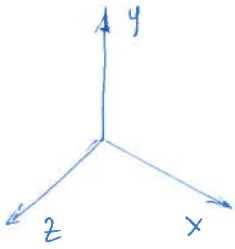
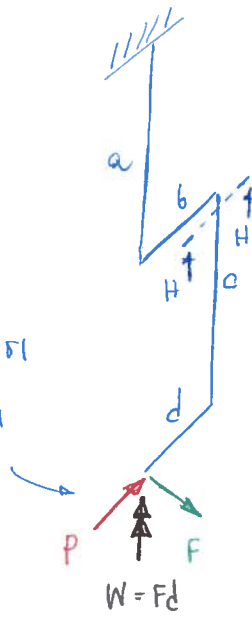


② TEMA D'ESAME · 17 LUGLIO 2014 · PARTI CH.



- ALBERNO A GOMITI
- FORZE COSTANTI NEL TEMPO!



DATI

- $F = 2000 \text{ N}$
- $P = 3000 \text{ N}$
- $a = c = 600 \text{ mm}$
- $b = d = 100 \text{ mm}$
- $D = 40 \text{ mm}$ (SOST. H-H)
- MATERIALE: 30NiCrMo3 BONIFICATO (\rightarrow DUTILE)
- $R_m = 1270 \text{ MPa}$
- $R_{p0.2} = 1000 \text{ MPa}$

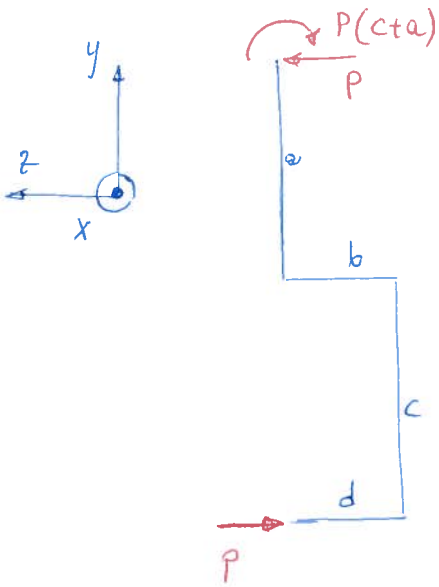
RICHIESTE

- 1) AZIONI INTERNE PER OGNI SINGOLA FORZA (N, M_f, M_t)
- 2) RAPPRESENTARE FORZE AGENTI E VERIFICA IN H-H
- 3) SUPPONENDO $K_{Lf} = 1,4$ E $K_{Lt} = 1,5$ NESEGUIRE VERIFICA STATICA SU H (\rightarrow INCLINATO VERIFICA DI PLASF.)
- 4) TENSORE SFORZI NORMALI NEL P.TO PIU' SOLLECITATO IN H-H E CARICOLARE $\Sigma \sigma_{max}$

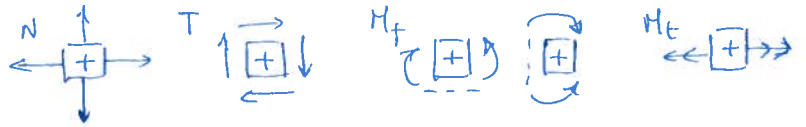
1) AZIONI INTERNE \rightarrow principio sovrapposizione delle azioni degli effetti: considerare singoli contributi

P

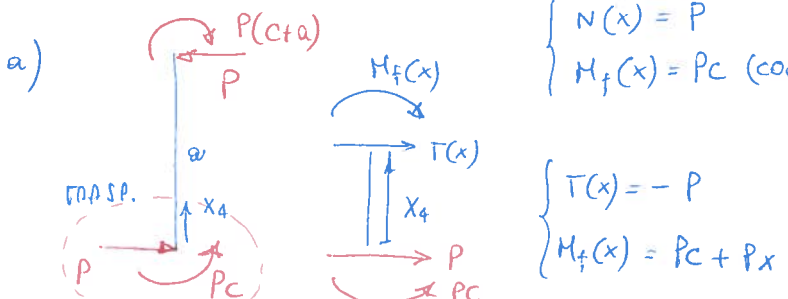
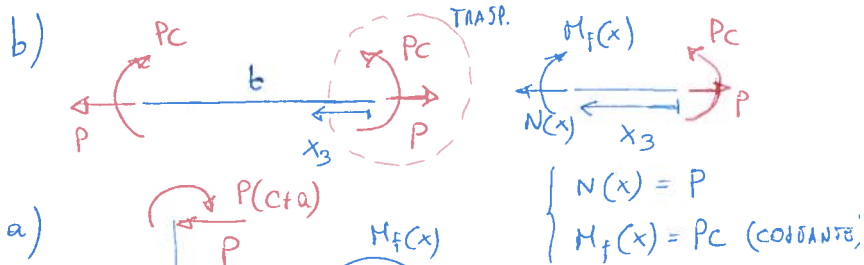
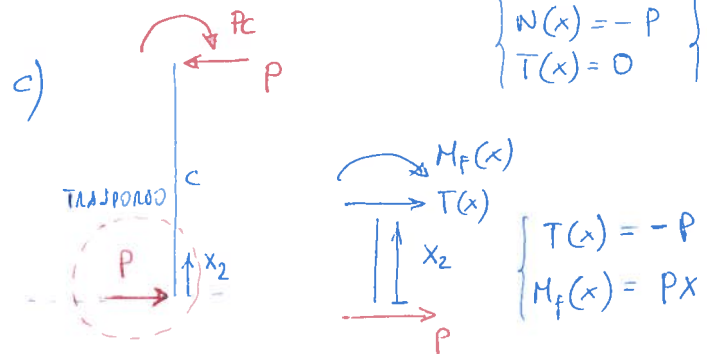
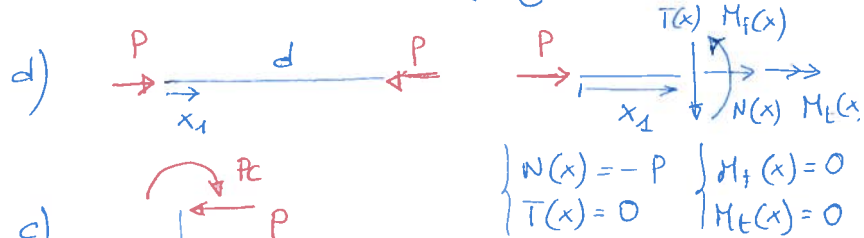
STR. INFERA 2D



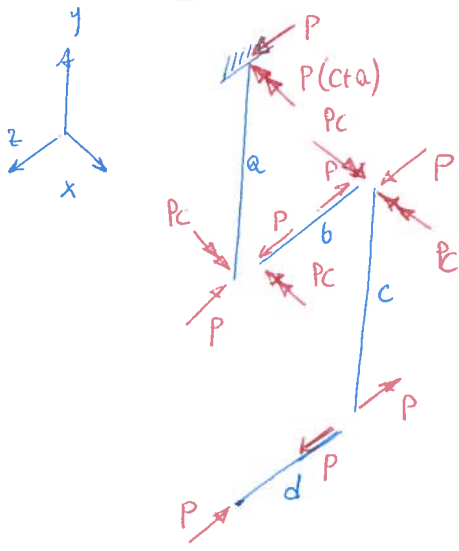
CONVENZIONI



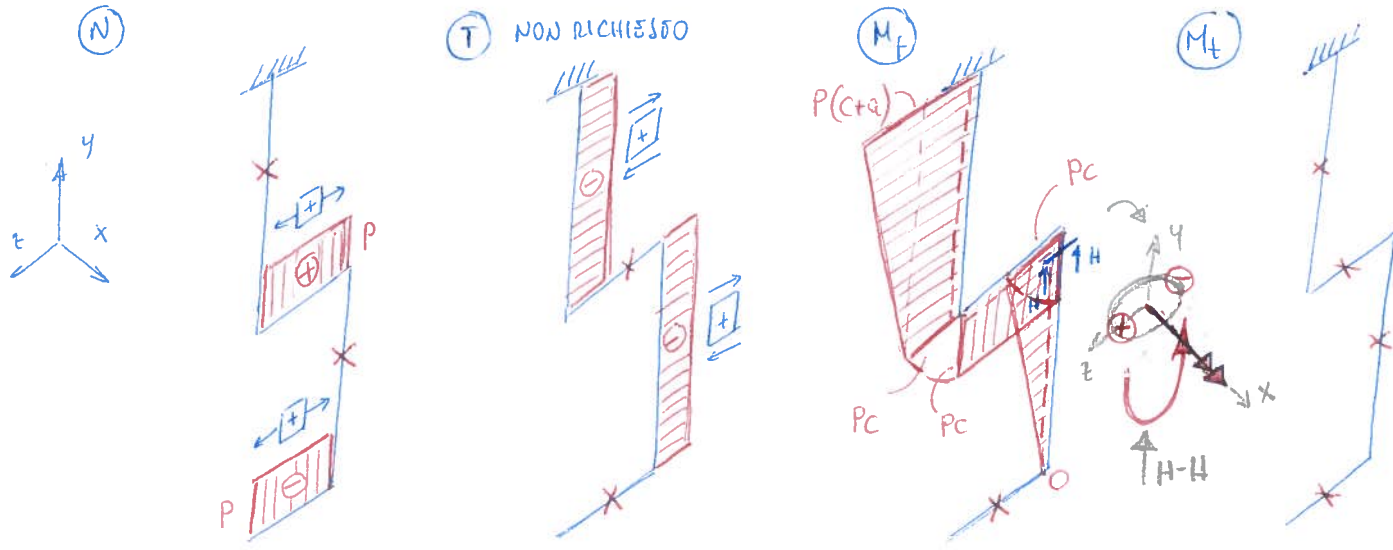
SINGOLE ASSE 2D + AZIONI INT.



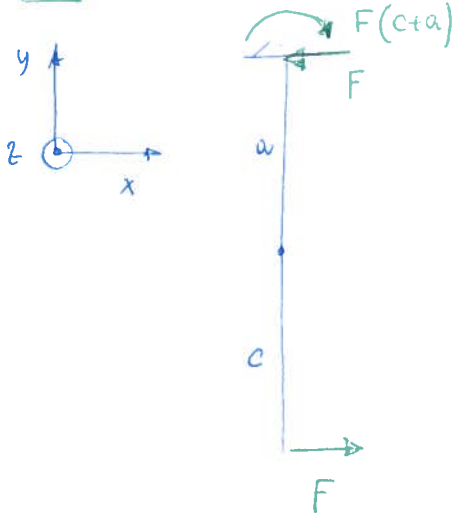
STR. 3D



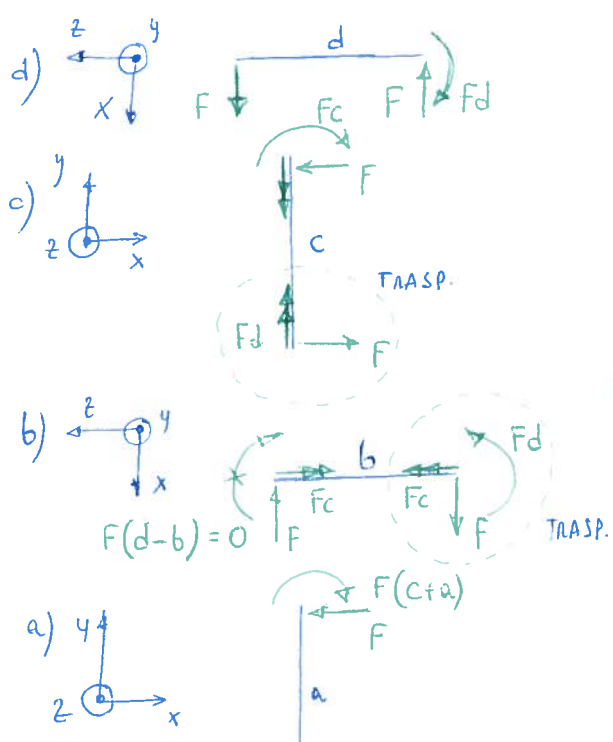
AZIONI INTERNE CAUSATE DA P:



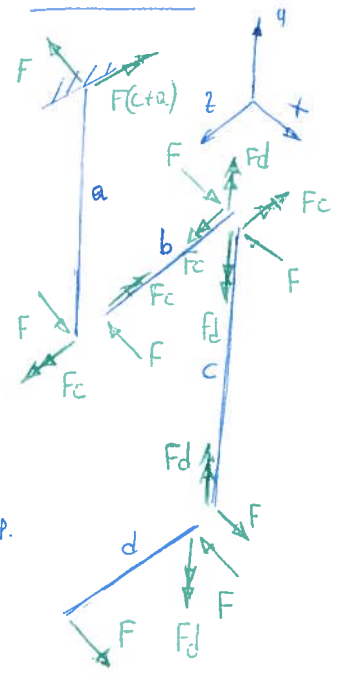
[F] SGA. INTERNA 2D



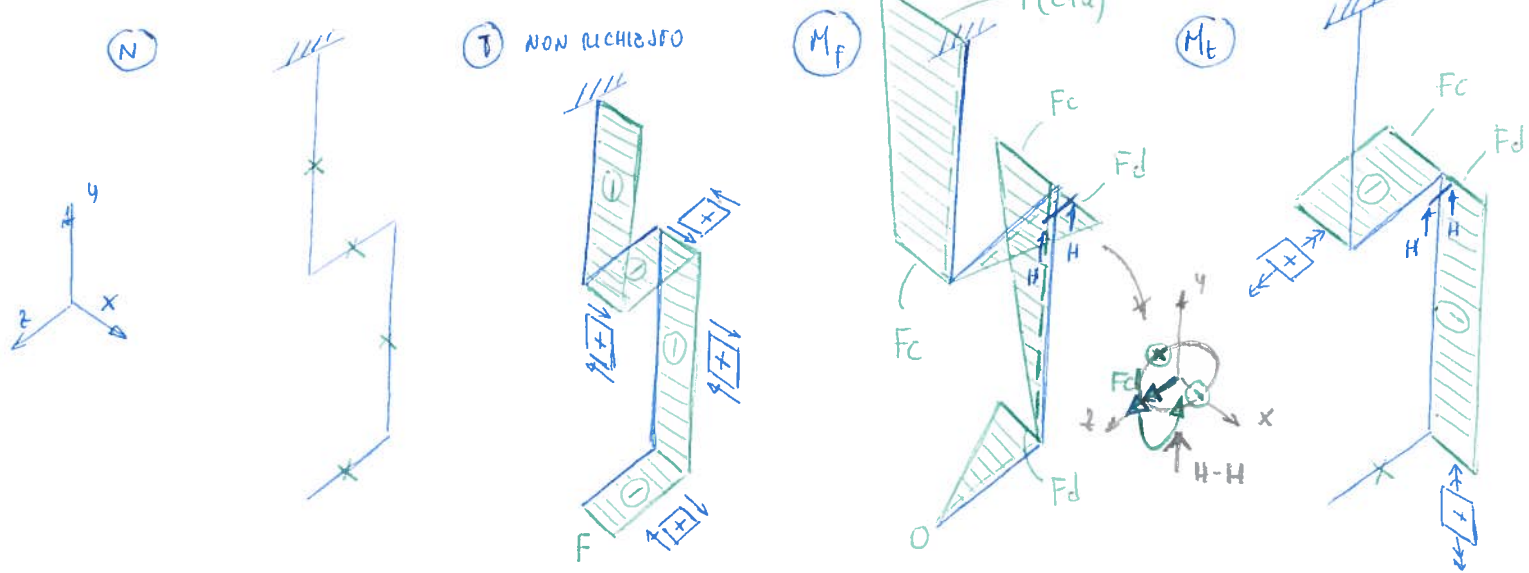
SINGOLE AZIONE 2D



SGA. 3D



AZIONI INTERNE CAUSATE DA F:

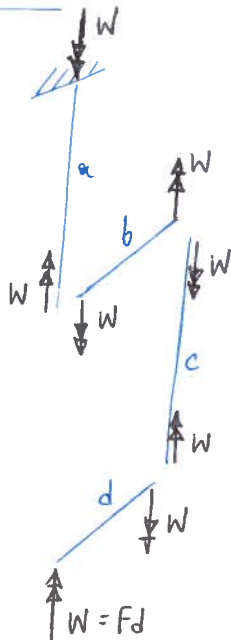
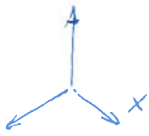


W

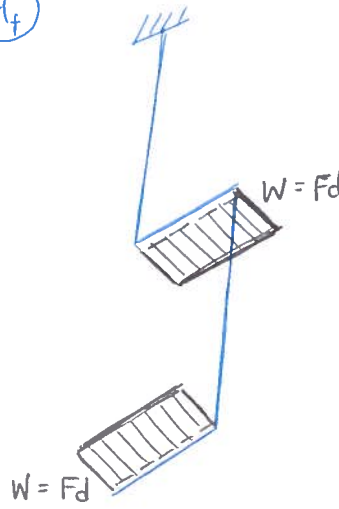
Sol. 3D

AZIONI INTERNE CAUSATE DA W:

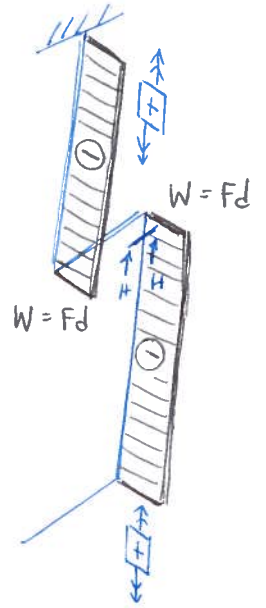
(N) e (T) X



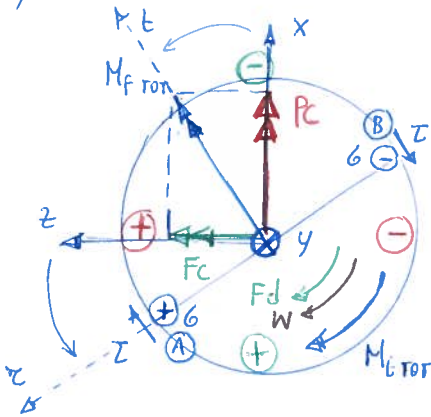
(M_f)



(M_t)



2) SEZIONE H-H



$$M_{fTOR} = \sqrt{(Pc)^2 + (Fc)^2} =$$

$$= \sqrt{(3000N \cdot 600mm)^2 + (2000N \cdot 600mm)^2} = 2,163 \cdot 10^6 N \cdot mm$$

$$M_{tTOR} = Fd + W = 2Fd = 2(2000N)(100mm) = 0,4 \cdot 10^6 N \cdot mm$$

PUNTI PIU' SOLLECITATI: A e B

HP. TRASCURIAMO I DATA DALL'AZIONE DI TAGLIO

$$\sigma_{nom} = \frac{32 M_{fTOR}}{\pi D^3} = \frac{32 \cdot 2,163 \cdot 10^6 N \cdot mm}{\pi \cdot 40^3 mm^3} \approx 344 MPa$$

$$\tau_{nom} = \frac{16 M_{tTOR}}{\pi D^3} = \frac{16 \cdot 0,4 \cdot 10^6 N \cdot mm}{\pi \cdot 40^3 mm^3} \approx 32 MPa$$

VERIFICA STATICA → HP. CONDIZIONE CRITICA: PLASTIFICAZIONE TOTALE DELLA SEZIONE

$$\text{MAT. DUTTILE: } K_S = 1 \Rightarrow \sigma_{VM}^* = \sqrt{\sigma_{nom}^2 + 3\tau_{nom}^2} = \sqrt{344^2 + 3 \cdot 32^2} \approx 348 MPa$$

$$\Rightarrow \eta_{PL.TOR} = \frac{R_{p0.2}}{\sigma_{VM}^*} = \frac{1000}{348} \approx 2,87 > 1,5 \text{ VERIFICATA!}$$

3) $K_{t_f} = 1,4$, $K_{t_t} = 1,5$

VERIFICA STATICA → HP. CONDIZIONE CRITICA: PRIMA PLASTIFICAZIONE $K_S = K_t$

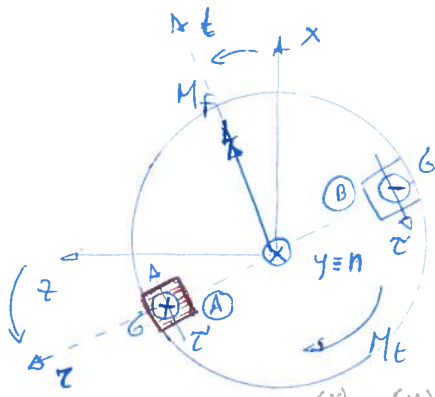
$$\Rightarrow \sigma_{VM}^* = \sqrt{\sigma_{max}^2 + 3\tau_{max}^2} = \sqrt{\left(\frac{K_{t_f} \sigma_{nom}}{1,4}\right)^2 + 3\left(\frac{K_{t_t} \tau_{nom}}{1,5}\right)^2} \approx 489 MPa$$

$$\Rightarrow \eta_{IPL} = \frac{R_{p0.2}}{\sigma_{VM}^*} = \frac{1000}{489} \approx 2 > 1,5 \text{ VERIFICATA!}$$

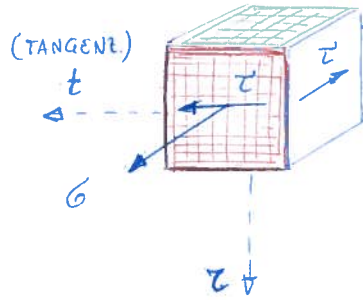
4) TENSORE SFORZI NOMINALI

PUNTO (A):

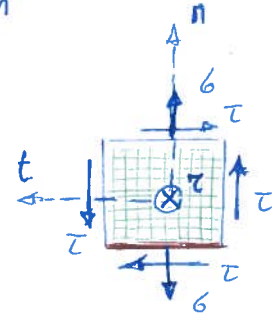
(NORMALE)



(TANGENTE)



⇒



(RADIALE)

$$\underline{\underline{\sigma}}(A) = \begin{bmatrix} 0 & -32 & 0 \\ -32 & 344 & 0 \\ 0 & 0 & 0 \end{bmatrix} \begin{matrix} t(x) \\ n(y) \\ z(z) \end{matrix}$$

SFORZI PRINCIPALI

$$\sigma_p = \frac{\sigma_t + \sigma_n}{2} \pm \sqrt{\left(\frac{\sigma_t - \sigma_n}{2}\right)^2 + \tau_{tn}^2}$$

$$\frac{344}{2} \pm \sqrt{\left(\frac{-344}{2}\right)^2 + 32^2}$$

$$\underbrace{172}_{x_c} \pm \underbrace{175}_R$$

$$\begin{cases} \sigma_I = 347 \text{ MPa} \\ \sigma_{II} = 0 \text{ MPa} \\ \sigma_{III} = -3 \text{ MPa} \end{cases}$$

$$\Rightarrow \tau_{max} = \frac{\sigma_I - \sigma_{III}}{2} = \frac{347 + 3}{2} = 175 \text{ MPa}$$

CERCHI DI MOHR (NON RICHIESTO)

