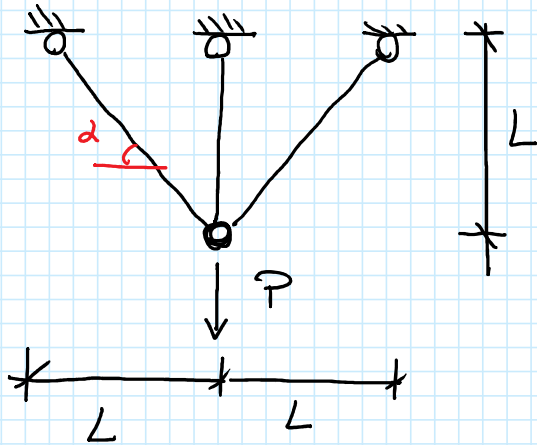


## Criteri di verifica

1. Metodo delle funzioni ammissibili
  2. Metodo del calcolo a rotture
  3. Metodo probabilistico
  4. Metodo semi-probabilistico
- } Metodi deterministici

# Metodo delle tensioni ammissibili



$$P = 350 \text{ kN}$$

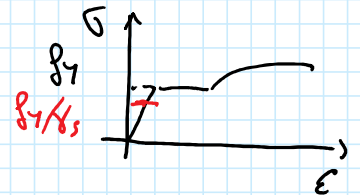
$$S 275 \quad \bar{\sigma}_s = \frac{275}{1,5} = 183,34 \text{ Pa}$$

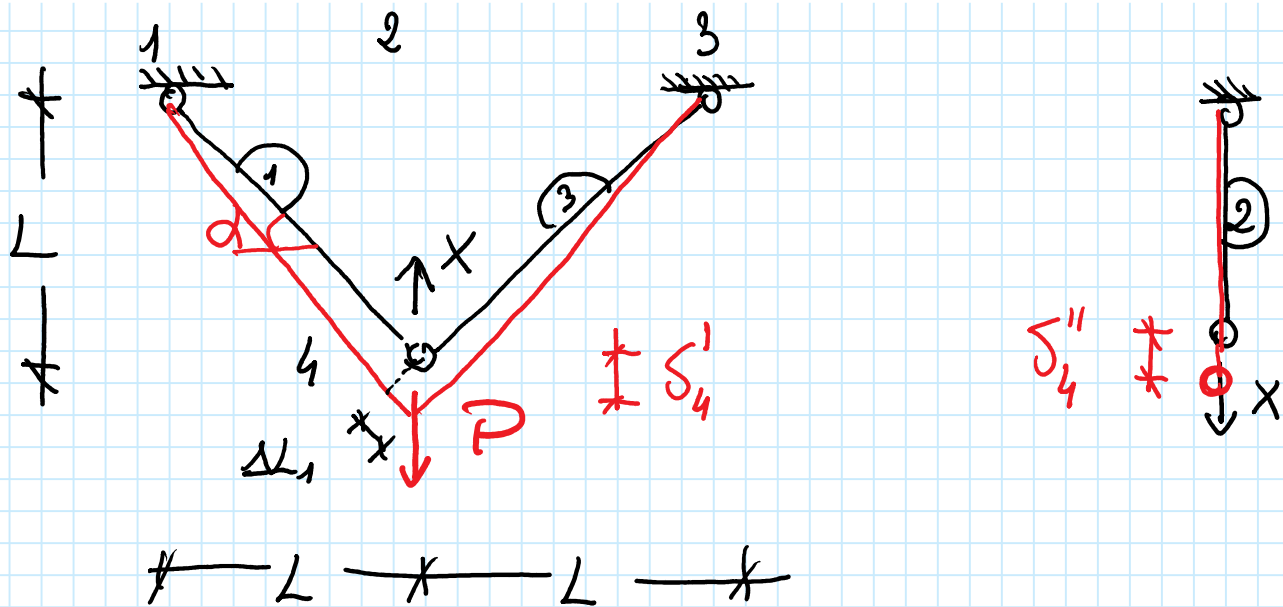
$$\text{⊗} \quad A = 10 \text{ cm}^2$$

$$\alpha = 45^\circ$$

$$P \rightarrow \begin{matrix} N, M \\ \cancel{V}, \cancel{T} \end{matrix} \rightarrow \sigma_{\max} \leq \frac{f_y}{\gamma_s} = \bar{\sigma}_s \quad \text{tensioni ammissibili}$$

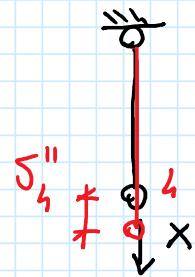
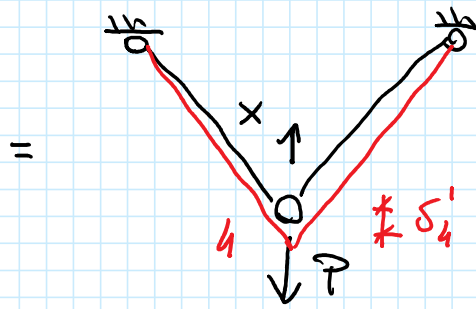
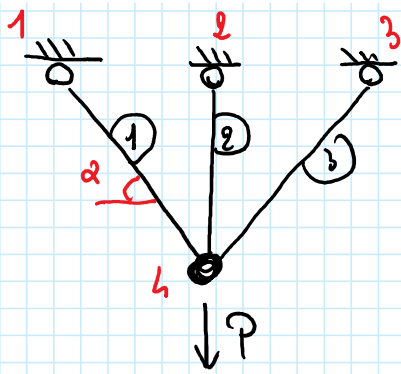
$$\gamma_s \geq 1 \quad \gamma_s = 1,5$$



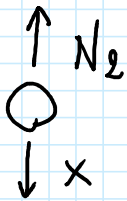
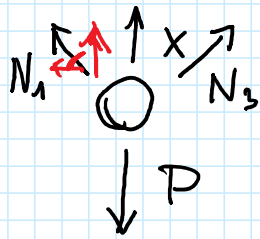


2 eq. di equilibrio del nodo

1 cond. di congruenza  $\rightarrow$  1 eq.



Equazioni di equilibrio del nodo



$$-N_1 \cos \alpha + N_3 \cos \alpha = 0 \Rightarrow N_1 = N_3$$

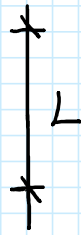
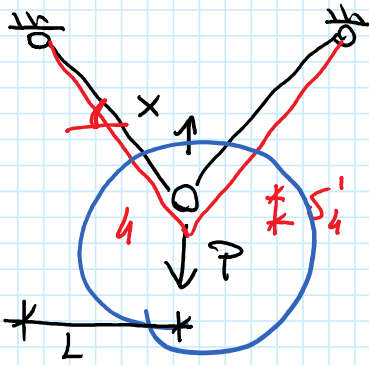
$$-P + x + N_1 \sin \alpha + N_3 \sin \alpha = 0$$

$$2 N_1 \sin \alpha = P - x \Rightarrow N_1 = N_3 = \frac{P - x}{2 \sin \alpha}$$

$$N_2 = x$$

$$\delta_4' = \delta_4'' \Rightarrow X$$

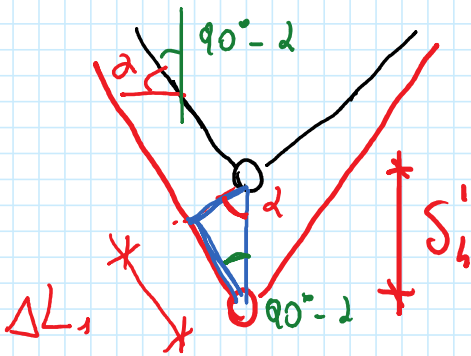
Condizione di congruenza



$$L_1 = \frac{L}{\sin 2}$$

$$\Delta L_1 = \frac{N_1 L_1}{E_s A} = \frac{N_1 L}{E_s A \sin 2}$$

$$\boxed{\delta_4' = \frac{\Delta L_1}{\sin 2} = \frac{N_1 L}{E_s A \sin^2 2}}$$





$$\delta_4'' = \Delta L_2 = \frac{N_2 L_2}{E_s A} = \frac{N_2 L}{E_s A}$$

$$\delta_4'' = \Delta L_2$$

$$\frac{N_1 L}{E_s A 2m^2} = \frac{N_2 L}{E_s A} \Rightarrow \frac{P - X}{2m^3} = X$$

$$P - X = 2m^3 X \Rightarrow P = (1 + 2m^3) X \Rightarrow X = \frac{P}{1 + 2m^3}$$

$$N_2 = \frac{P}{1 + 2m^3}$$

$$N_1 = \frac{1}{2m} \left( P - \frac{P}{1 + 2m^3} \right) = \frac{1}{2m} \left( \frac{1 + 2m^3 - 1}{1 + 2m^3} \right) P = \frac{m^2}{1 + 2m^3} P$$

$$\sigma_{max} = \frac{N_{max}}{A} = \frac{N_2}{A}$$

$$N_2 = \frac{P}{1 + 2 \mu m^3 d} = \frac{350}{1 + 2 \times \left(\frac{\sqrt{2}}{2}\right)^3} = 205,03 \text{ KN}$$

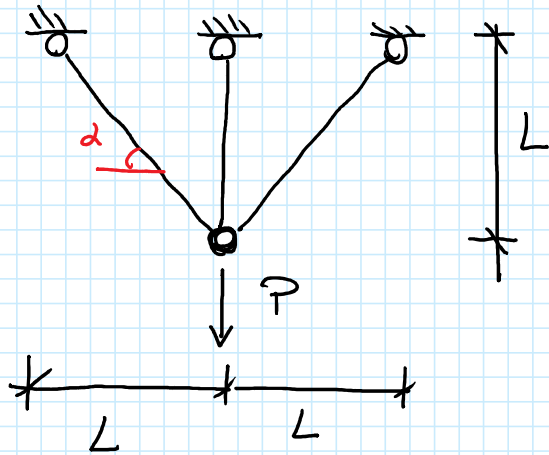
$$\sigma_{max} = \frac{N_2}{A} = \frac{205,03}{10} \times \frac{10^3}{10^2} = 205,03 \text{ MPa}$$

$$\sigma_{max} = 205,03 \text{ MPa} \not\leq \underbrace{\frac{f_y}{\gamma_s}}_{\sigma_s} = \frac{275}{1,5} = 183,3 \text{ MPa}$$

NO

∴

## Método del cálculo e rotura



$$P = 350 \text{ kN}$$

$$S 275$$

$$\text{⊗ } A = 10 \text{ cm}^2$$

$$\alpha = 45^\circ$$

$$\gamma_F P \leq P_m$$

$$\gamma_F = 1,5$$

$$N_1 = N_3 = \frac{\sin^2 \alpha}{1 + 2 \sin^3 \alpha} P$$

$$N_2 = \frac{P}{1 + 2 \sin^3 \alpha}$$

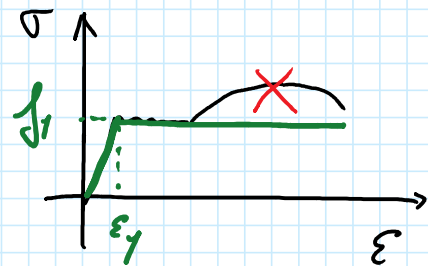
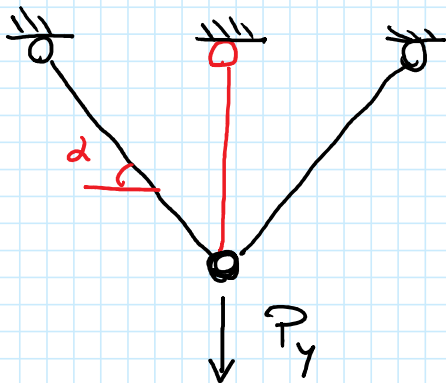
$$N_2 = N_y = \frac{P_y}{1 + 2 \sin^3 \alpha} \Rightarrow P_y = (1 + 2 \sin^3 \alpha) N_y$$

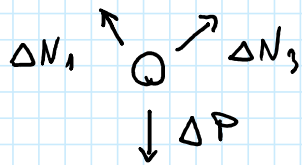
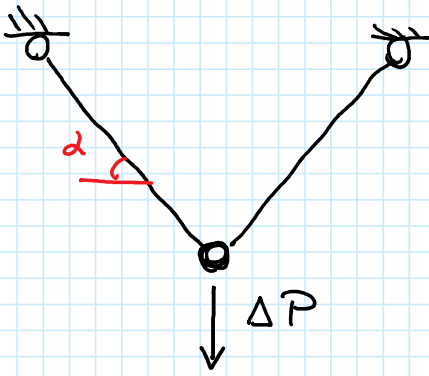


$$\sigma = \frac{N}{A} \Rightarrow f_y = \frac{N_y}{A} \Rightarrow N_y = A f_y$$

$$P_y = (1 + 2 \sin^2 \alpha) N_y \Rightarrow N_2 = N_y$$

$$N_1 = \frac{\sin^2 \alpha}{1 + 2 \sin^2 \alpha} P_y = \frac{\sin^2 \alpha}{1 + 2 \sin^2 \alpha} (1 + 2 \sin^2 \alpha) N_y = \sin^2 \alpha N_y$$





$$-\Delta N_1 \cancel{\cos \alpha} + \Delta N_3 \cancel{\cos \alpha} = 0 \quad \Delta N_1 = \Delta N_3$$

$$-\Delta P + \Delta N_1 \sin \alpha + \Delta N_3 \sin \alpha = 0$$

$$-\Delta P + 2 \Delta N_1 \sin \alpha = 0 \Rightarrow \Delta N_1 = \frac{\Delta P}{2 \sin \alpha}$$

$$N_y = \sin^2 \alpha N_y + \frac{\Delta P}{2 \sin \alpha} \Rightarrow N_y = \sin^2 \alpha N_y + \frac{\Delta P \mu}{2 \sin \alpha}$$

$$N_y = \sin^2 \alpha N_y + \frac{\Delta P_u}{2 \sin \alpha}$$

$$2 \sin \alpha N_y = 2 \sin^3 \alpha N_y + \Delta P_u$$

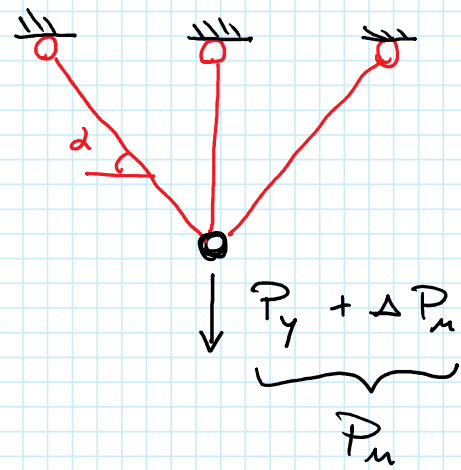
$$\Delta P_u = 2 \sin \alpha N_y - 2 \sin^3 \alpha N_y$$

$$\Delta P_u = 2 \sin \alpha (1 - \sin^2 \alpha) N_y$$

$$P_u = P_y + \Delta P_u = (1 + 2 \sin^2 \alpha) N_y + 2 \sin \alpha N_y - 2 \sin^3 \alpha N_y$$

$$= N_y + \cancel{2 \sin^2 \alpha N_y} + 2 \sin \alpha N_y - \cancel{2 \sin^3 \alpha N_y}$$

$$= (1 + 2 \sin \alpha) N_y$$



$$P_u = (1 + 2 \sin^2 \alpha) N_y = \left(1 + 2 \times \frac{\sqrt{2}}{2}\right) 275 = 663,9 \text{ kN}$$

$$N_y = A f_y = 10 \times 275 \times \frac{10^2}{10^3} = 275 \text{ kN}$$

$$\gamma_F P = 1,5 \times 350 = 525 \text{ kN} < P_u : 663,9 \text{ kN}$$

SI 😊