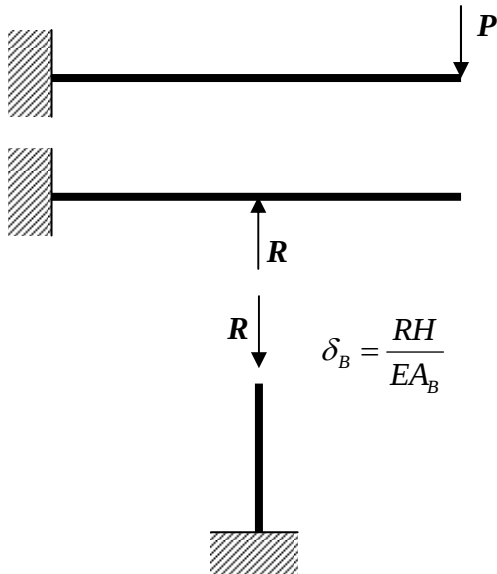


Problema 4.



$$\delta_B^P = \frac{P(L/2)^2}{6EI_V} (3L - L/2) = \frac{5PL^3}{48EI_V}$$

$$\delta_B^R = \frac{R(L/2)^3}{3EI_V} = \frac{RL^3}{24EI_V}$$

$$\delta_B = \frac{RH}{EA_B}$$

$$\delta_B = \delta_B^P - \delta_B^R \Rightarrow \frac{RH}{EA_B} = \frac{5PL^3}{48EI_V} - \frac{RL^3}{24EI_V}$$

$$R = \frac{5}{2} \left[1 + 24 \frac{I_V H}{A_B L^3} \right]^{-1} P$$

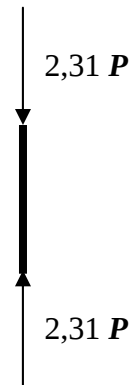
$$I_V = \frac{bh^3}{12} = 2,08 \times 10^{-10} \text{ m}^4, A_B = a^2 = 9,00 \times 10^{-6} \text{ m}^2, H = 150 \text{ mm}, L = 100 \text{ mm}, I_B = \frac{a^4}{12} = 6,75 \times 10^{-12} \text{ m}^4$$

$$R = 2,31P$$

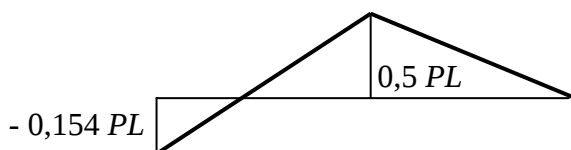
Reações na Viga



Reações na Barra



Distribuição de Momento Fletor na Viga

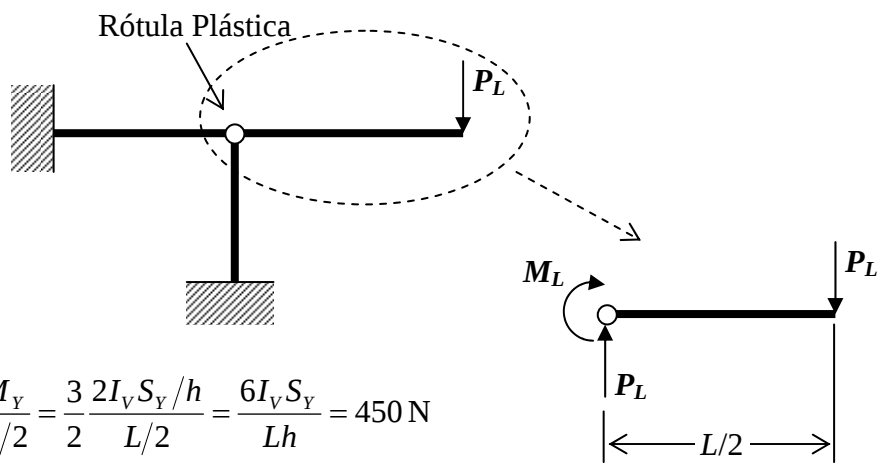


$$1) \text{ Falha por escoamento na viga: } \max\{\sigma_{xx}\} = \frac{h}{2} \frac{|M_{\max}|}{I_V} = \frac{h}{2} \frac{0,5PL}{I_V} < S_y \Rightarrow P < \frac{4S_y I_V}{Lh} = 300 \text{ N}$$

$$2) \text{ Falha por escoamento na barra: } \max\{\sigma\} = \frac{R}{A_B} = \frac{2,31P}{A_B} < S_y \Rightarrow P < \frac{S_y A_B}{2,31} = 1404 \text{ N}$$

$$3) \text{ Falha por flambagem na barra: } R = 2,31P < P_{cr} = \pi^2 \frac{EI_B}{H^2} \Rightarrow P < \frac{\pi^2}{2,31} \frac{EI_B}{H^2} = 257 \text{ N}$$

$$P_{\max} = 257 \text{ N}$$



$$P_L = \frac{M_L}{L/2} = \frac{3}{2} \frac{M_Y}{L/2} = \frac{3}{2} \frac{2I_V S_Y / h}{L/2} = \frac{6I_V S_Y}{Lh} = 450 \text{ N}$$