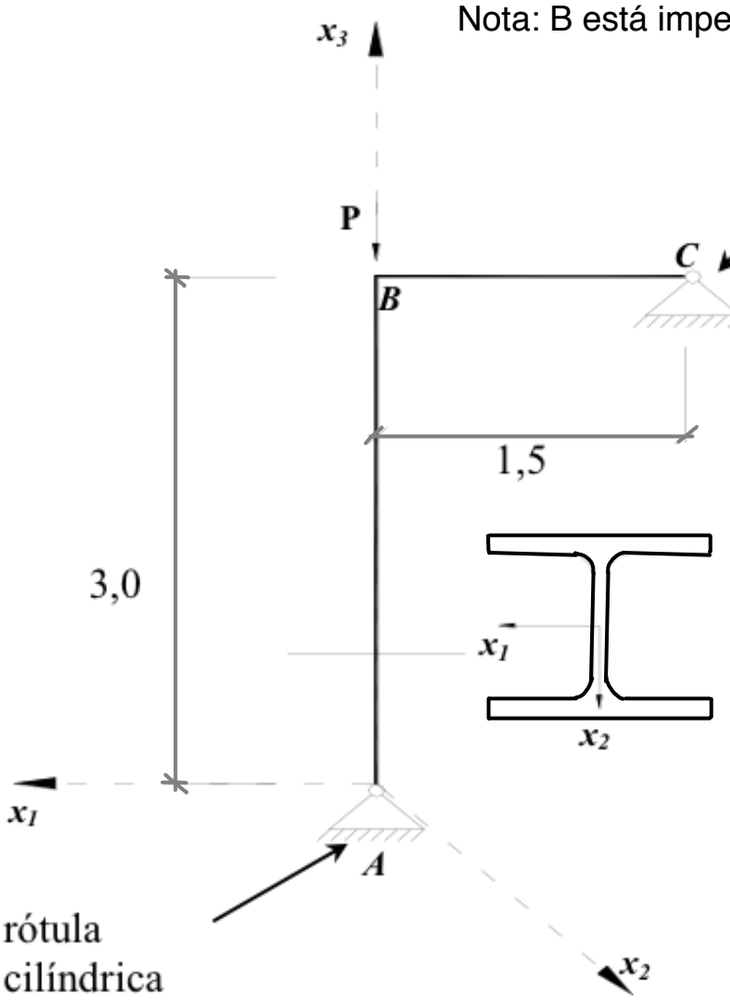
Nota: B está impedido de se deslocar fora do plano da estrutura



Coluna AB:

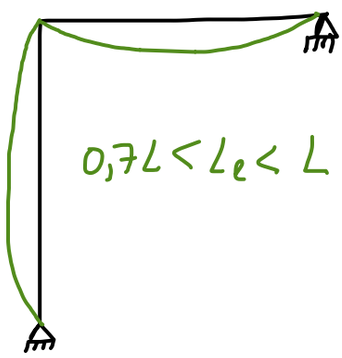
I_1=449,33 cm^4
I_2=348,0 cm^4
A=28,0 cm^2

E=210 GPa

Figura 5-5

a. Calcule a inércia da viga BC de modo a que a encurvadura no plano 1-3 se verifique para a carga P=1500 kN.

Plano 1-3 = Plano da estrutura $\Rightarrow I = I_2$

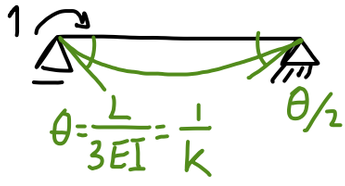


$$1500 = \frac{\pi^2 \times 210\times10^6 \times 348\times10^{-8}}{L_e^2} \Rightarrow L_e = 2{,}193 \Rightarrow L_e/L = 0{,}731$$

$\eta_1 = 1$ (apoio A)

$$\ell/L = \left[\frac{1 + 0{,}145(\eta_1+\eta_2) - 0{,}265\,\eta_1\eta_2}{2 - 0{,}364(\eta_1+\eta_2) - 0{,}247\,\eta_1\eta_2}\right] \Rightarrow \eta_2 = 0{,}156$$

$\ell/L = 0{,}731$

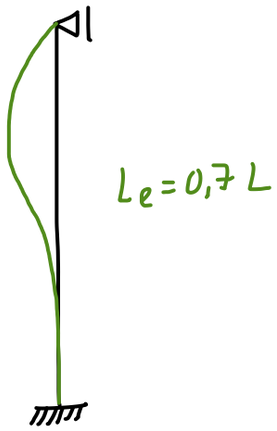


$$0{,}156 = \frac{1}{1 + k\frac{3}{4\times E\times 348\times10^{-8}}} \Rightarrow \frac{k}{E} \simeq 25{,}1\times10^{-6}$$

$$\frac{3EI}{L} = k = 25{,}1\times10^{-6}E \Rightarrow I = \frac{25{,}1\times10^{-6}\times 1{,}5}{3} \simeq 1255 \text{ cm}^4$$

b. Para a situação da alínea a), calcule a carga crítica da coluna.

plano 2-3 ≡ plano ⊥ estrutura



$$P_{cr}^{\perp} = \frac{\pi^2 \times 210 \times 10^6 \times 449{,}33 \times 10^{-8}}{(0{,}7 \times 3)^2} = 2112\ kN$$

$$P_{cr} = \text{mín}\,(2112, 1500) = \underline{\underline{1500}}\ kN$$