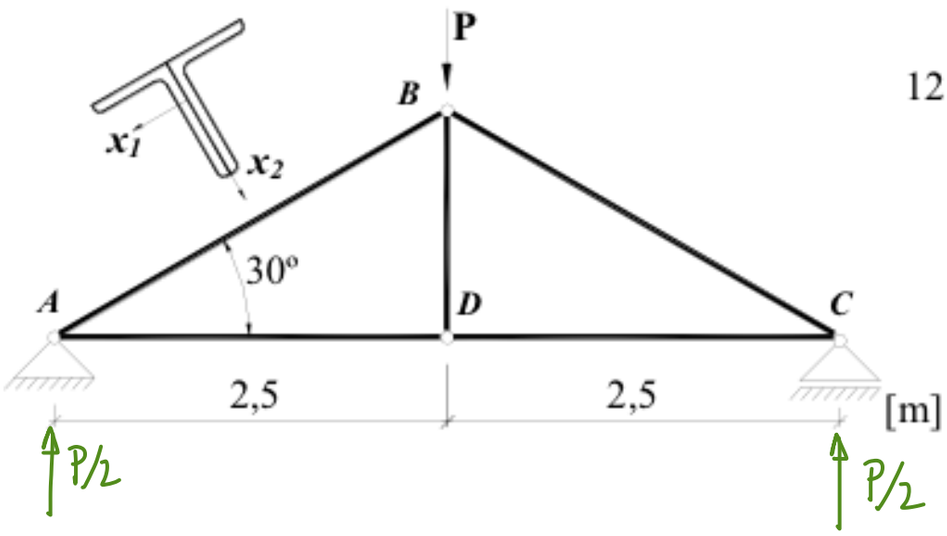
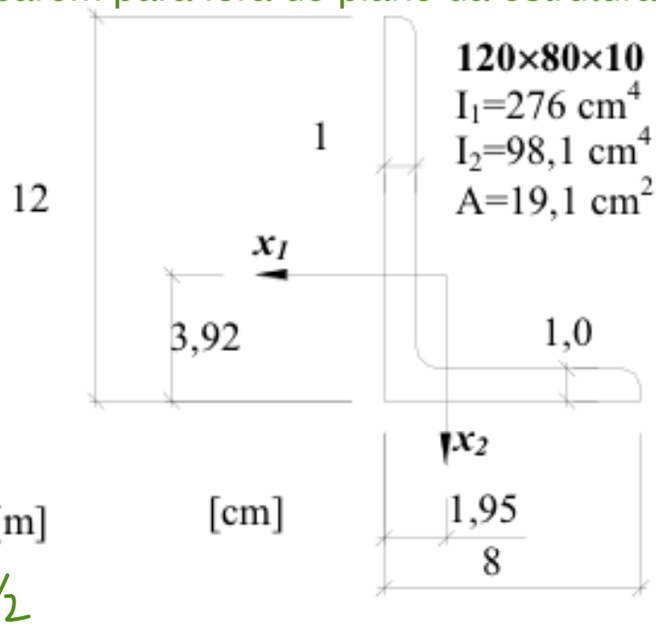
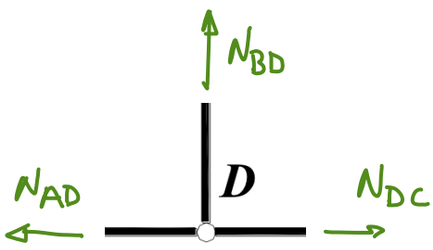
3. Considere a treliça em aço S355 representada na figura seguinte, com rótulas esféricas em todos os nós e barras constituídas por pares de cantoneiras 120×80×10.

NOTA: todos os nós estão impedidos de se deslocarem para fora do plano da estrutura

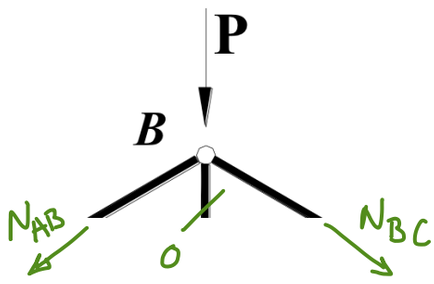






$N_{BD} = 0$

$N_{DC} = N_{AD}$



$2\, N_{BC} \frac{1}{2} = -P$

$N_{BC} = -P$

$\Downarrow$

$N_{AD} = \frac{\sqrt{3}}{2} P$

$I_1 = 2 \times 276 = 552\ cm^4$ (plano estrutura)

$I_2 = 2 \times (98{,}1 + 1{,}95^2 \times 19{,}1) = 341{,}5\ cm^4$ (plano $\perp$ estrutura)

$$P_{cr} = \frac{\pi^2 E I_2}{l_e^2} = 849{,}2\ kN$$

$$l_e = \frac{2{,}5}{\sqrt{3}/2} = 2{,}887$$

$$P_{cd} = 2 \times 19{,}1 \times 10^{-4} \times 355 \times 10^3 = 1356\ kN$$

$$N_{AD} \leq P_{cd} \Rightarrow P \leq \frac{2 \times 1356}{\sqrt{3}} = 1566$$

EC 3

$$P_{cd} = 2 \times 19{,}1 \times 10^{-4} \times 355 \times 10^{3} = \underline{\underline{1356\ kN}}$$

$$\bar{\lambda} = \sqrt{\frac{P_{cd}}{P_{cn}}} = 1{,}264$$

$$\alpha = 0{,}49 \quad (\text{curva } c)$$

$$\phi = 0{,}5 \left[1 + 0{,}49 \left(1{,}264 - 0{,}2 \right) + 1{,}264^{2} \right] = 1{,}559$$

$$\chi = \frac{1}{1{,}559 + \sqrt{1{,}559^{2} - 1{,}264^{2}}} = 0{,}405$$

$$N_{b,Rd} = 0{,}405 \times 1356 = \underline{\underline{548{,}5\ kN}}$$