AM15 - AB - B2

$$I_x = \frac{0,8 \times 60^3}{12} + 2\left(\frac{30 \times 2,5^3}{12} + 30 \times 2,5 \times \left(\frac{60+2,5}{2}\right)^2\right) = 160936 cm^4$$

$$W_x = I_x / d/2 = 160936 cm^4 / (60 + 2 \times 2,5)/2 = 4953 cm^3$$

$$Z_x = 2\left(30 \times 2,5 \times \left(\frac{60+2,5}{2}\right) + \left(\frac{60 \times 0,8}{2}\right) \times \left(\frac{60}{4}\right)\right) = 5408 cm^3$$

$$A = 30 \times 2,5 \times 2 + 60 \times 0,8 = 198 cm^2$$

$$I_y = 60 \times 0,8^3/12 + 2\left(2,5 \times 30^3/12\right) = 11253 cm^3$$

$$r_y = \sqrt{\frac{I_y}{A}} = \sqrt{\frac{11253}{198}} = 7,539 cm$$

$$\lambda = \frac{0,5\,L}{r_y} = \frac{0,5 \times 600 cm}{7,539 cm} = 39,79$$

$$\lambda_p = 1,76\sqrt{\frac{20000}{25}} = 49,78$$

} VIGA CURTA

$$M_{RdFLT} = Z_x \cdot f_y / 1,1 = 5408 \times 25 / 1,1 = 122910 kNcm$$

$$M_{RdFLT} = 1229 kNm$$

- COMB. DE AÇÕES ELU:

$$Sd = 1,25 \times q + 1,25 \times M + 1,5P$$

$$Sd = 1,25 \times 2 kN/m + 1,25 \times 5 kNm + 1,5P$$

$$Sd = \underbrace{2,5 kN/m}_{q_{Sd}} + \underbrace{6,25 kNm}_{M_{Sd}} + \underbrace{1,5P}_{P_{Sd}}$$

$M_{sd\,MÁX} = \frac{q_{sd} \cdot L^2}{2} + M_{sd} + P_{sd} \cdot L$

$M_{sd\,MÁX} = \frac{2{,}5 \times 6^2}{2} + 6{,}25 + 1{,}5P \times 6$

$M_{sd\,MÁX} = 51{,}25 + 9P$ //

IGUALANDO $M_{sd\,MÁX} = M_{Rd\,FLT}$

$51{,}25 + 9P = 1229 \qquad P = \frac{1229 - 51{,}25}{9} = 130{,}9\ kN$ //

- COMB. AÇÕES ELS:

$S_K = \Sigma G_i + \psi_1 Q_1 + \Sigma Q_j \psi_{2j}$

$S_K = 2\,kN/m + 5\,kN/m + 0{,}7P$

$\delta_{CALC} = \frac{1}{8}\frac{qL^4}{EI} + \frac{1}{2}\frac{ML^2}{EI} + \frac{1}{3}\frac{PL^3}{EI}$

$\frac{2\,kN}{m} \times \frac{1\,m}{100\,cm} = \frac{0{,}02\,kN}{cm}$

$5\,kN/m \times \frac{100\,cm}{1\,m} = 500\,kN/cm$ //

$EI = 20000\,kN/cm^2 \times 160936\,cm^4 = 3{,}2187 \times 10^9\,kN\,cm^2$

$\delta_{CALC} = \frac{1}{3{,}2187 \times 10^9} \times \left(\frac{0{,}02 \times 600^4}{8} + \frac{500 \times 600^2}{2} + \frac{0{,}7P\,600^3}{3} \right)$

$\delta_{CALC} = (1{,}566 \times 10^{-2} P + 0{,}12863)\ cm$

$\delta_{LIM} = L/350 = 600\,cm/350 = 1{,}714\,cm$

IGUALANDO $\delta_{CALC} = \delta_{LIM}$

$1{,}566 \times 10^{-2} P + 0{,}1286 = 1{,}714$

$P = \frac{1{,}714 - 0{,}1286}{1{,}566 \times 10^{-2}} = 101{,}24\ kN$ //