

sollicitation: $M = -\frac{Pl^2}{2}$

E.L.U: $P_u = 1,35 \times 80 + 1,5 \times 70 = 213 \text{ KN/m}$ (0,15)

E.L.S: $P_{ser} = 80 + 70 = 150 \text{ KN/m}$ (0,15)

Les Moments: $M_u = \frac{213(1,5)^2}{2} = 239,625 \text{ KN.m}$ (0,15)

$M_{ser} = \frac{150(1,5)^2}{2} = 168,75 \text{ KN.m}$ (0,15)

Calcul de ferrailage à l'E.L.U:

$M_t = 14,16 \times 50 \times 15 \times \left(41 - \frac{15}{2}\right) \times 10^{-3} = 355,77 \text{ KN.m}$ (0,15)

$M_u < M_t \Rightarrow$ section rectangulaire (b x h). (0,15)

$\mu_{bu} = \frac{239,625 \times 10^3}{50(41)^2 \times 14,16} = 0,201 < 0,392 \Rightarrow \text{S.R.S.A } (A_{sc} = 0)$ (0,15)

tableau $\Rightarrow \beta_u = 0,8866$ (0,15)

$A_{st} = \frac{239,625 \times 10^3}{0,8866 \times 41 \times 348} = 18,94 \text{ cm}^2$ (0,15)

Vérification à l'E.L.S:

$H = \frac{50 \times (15)^2}{2} - 15 \times 18,94(41 - 15) = -1761,6 \text{ cm}^3$ ($0 \Rightarrow \text{S.R.T}$) (0,15)

$D = \frac{(50 - \frac{15}{2}) \times 15 + 15 \times 18,94}{15} = 53,94 \text{ cm}$ (0,15)

$E = \frac{(50 - 15) \times (15)^2}{15} + 30 \times 18,94 = 207808 \text{ cm}^3$ (0,15)

$y_{ser} = -53,94 + \sqrt{(53,94)^2 + 207808} = 16,68 \text{ cm}$ (0,15)

$I_{ox} = \frac{50 \times (16,68)^3 - (50 - 15)(16,68 - 15)^3}{12} + 15 \times 18,94(41 - 16,68) = 399906 \text{ cm}^4$ (1,0)

$K = \frac{168,75 \times 10^6}{399906 \times 10^4} = 0,042 \text{ N/mm}^3$, $G_{sc} = 0,042 \times 16,68 = 7,034 \text{ Pa}$ ($G_{sc} = 15 \text{ Pa}$ (C.V)) (0,15)

$G_{st} = 15 \times 0,042(41 - 16,68) \times 10 = 153,216 \text{ MPa}$ ($G_{st} = 201,63 \text{ MPa}$ (C.V)) (0,15)