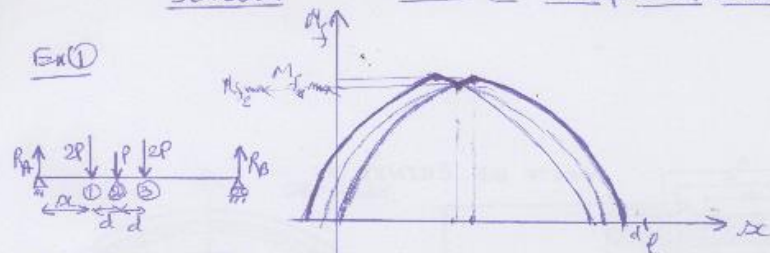


Solution

Examen Charpentes métalliques

Ex(1)



$$R_A = 5P(l-x-d)$$

$$M_{f1} = R_A x = 5P(l-x-d)x ; M_{f2} = R_A(x+d) - 2dP = 5P(l-x-d)(x+d) - 2dP$$

$$M_{f3} = R_A(x+2d) - 2P \cdot 2d - Pd = 5P(l-x-d)(x+2d) - 5dP$$

$$\frac{dM_{f1}}{dx} = 0 \rightarrow x = \frac{l-d}{2} \rightarrow M_{f1, \max} = M_{f1}\left(\frac{l-d}{2}\right) = \frac{5P}{4}(l-d)^2$$

$$\frac{dM_{f2}}{dx} = 0 \rightarrow x = \frac{l-2d}{2} \rightarrow M_{f2, \max} = \frac{5P}{4}\left(l^2 - 8\frac{d}{l}\right)$$

$$\frac{dM_{f3}}{dx} = 0 \rightarrow x = \frac{l-3d}{2} \rightarrow M_{f3, \max} = \frac{5P}{4}\left((l+d)^2 - 4d\right)$$

$$M_{f1}(x) = 0 \rightarrow x = 0 \vee x = l-d$$

$$M_{f2}(x) = 0 \rightarrow x_{1,2} = \frac{l-2d}{2} \pm \frac{\sqrt{\Delta}}{(-10)} ; \Delta = 25(l-2d)^2 + 20d(5l-5d-2)$$

$$M_{f3}(x) = 0 \rightarrow x_{1,2} = \frac{(l-3d)^2}{-2} \pm \frac{\sqrt{\Delta}}{(-2)} ; \Delta = l^2 + 2ld + d^2 - 4d$$

$$M_{f1, \max} = M_{f3, \max}$$

EX(2)  $T = 1000 \text{ kN} ; N' = 333,33 \text{ kN} ; N'' = 666,66 \text{ kN} ; N = 25 \text{ kN}$

1. Cordons des semelles

- Sup ( $N' = 333,33 \text{ kN}$ )

$$\sigma_{11}' = 0 ; \sigma_{11}' = \sigma_{11}' = \frac{N'}{\sqrt{2}(2a)} = \frac{333,33}{\sqrt{2}(0,5 \cdot 60)} = 7,88 \text{ kN/cm}^2 < 24$$

- Inf ( $N = 25 \text{ kN}$ )

$$\sigma_{11} = 0 ; \sigma_{11} = \sigma_{11} = \frac{N}{\sqrt{2}(2a)} = \frac{25}{\sqrt{2}(0,5 \cdot 60)} = 0,59 \text{ kN/cm}^2 < 24$$

2. Cordons des goussets ( $N''$ )

$$\sigma_{11}'' = 0 ; \sigma_{11}'' = \sigma_{11}'' = \frac{N''}{\sqrt{2}(2a)} = \frac{666,66}{\sqrt{2}(4 \cdot 0,5 \cdot 15)} = 15,76 \text{ kN/cm}^2 < 24$$

3. Cordons des âmes (T)

$$\sigma_{11} = \sigma_{11} = 0 ; \sigma_{11} = \frac{T}{2(30-1)0,5} = \frac{1000}{29} = 34,5 > (5) \Rightarrow$$

$\Rightarrow$  L'assemblage n'est pas possible pour  $a = 0,5$   
 Solution en ayant une soudure superposée  
 $a = 1 \text{ cm}$   
 $\sigma_{11} = \frac{1000}{29 \times 2} = 17,2$   
 $17,2 < 24$