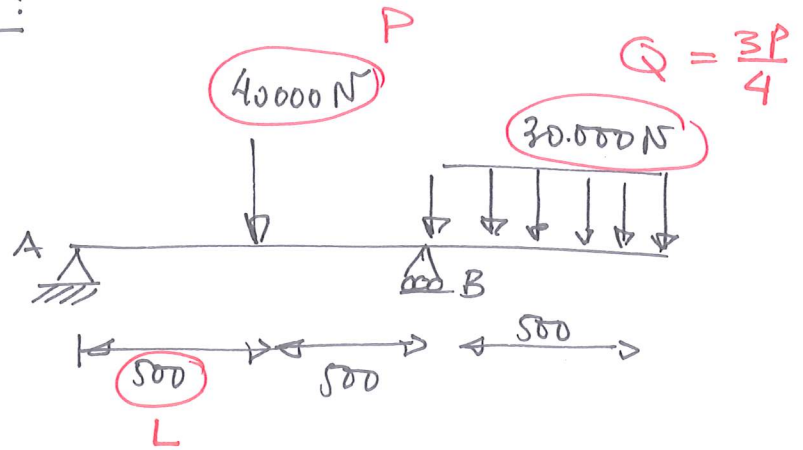
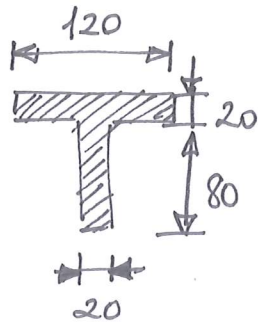


2.4.47

GIVET:

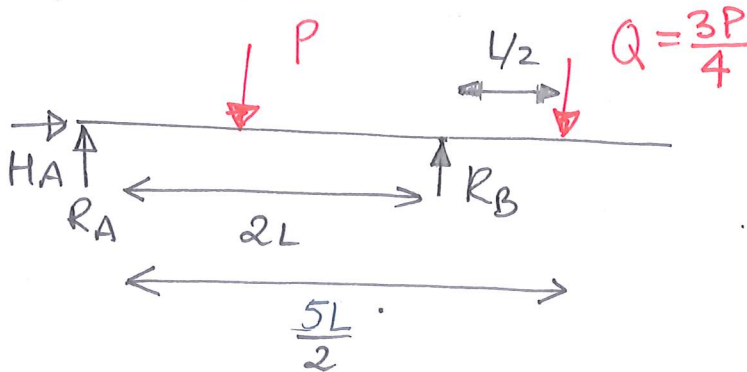


SÖKT: Maximala drag- och tryckspänningen.

LÖSNINGEN:

- 1.- global jmv \rightarrow Reak.
- 2.- snitta & jmv \rightarrow Inre kraft + moment.
- 3.- spänning.
- 4.- max spänning.

1.- Global jmv:



$$H_A = 0$$

$$\sum M_A: R_B = \frac{PL + \frac{5Q}{2}L}{2L}$$

$$R_B = P/2 + 5/4 Q$$

$$\uparrow R_A + R_B - P - Q = 0 \Rightarrow R_A = P/2 - Q/4$$

2.- snitta och jmv:

$$\begin{cases} R_A = +5P/16 \\ R_B = 12P/16 = 3P/4 \end{cases}$$

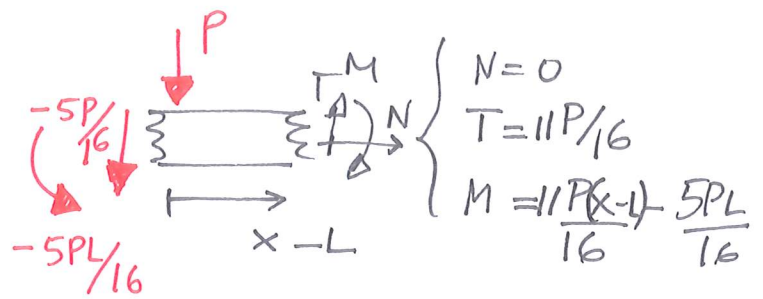
$$0 \leq x \leq L.$$

$$\begin{cases} M(0) = 0 \\ M(L) = -\frac{5PL}{16} \end{cases}$$

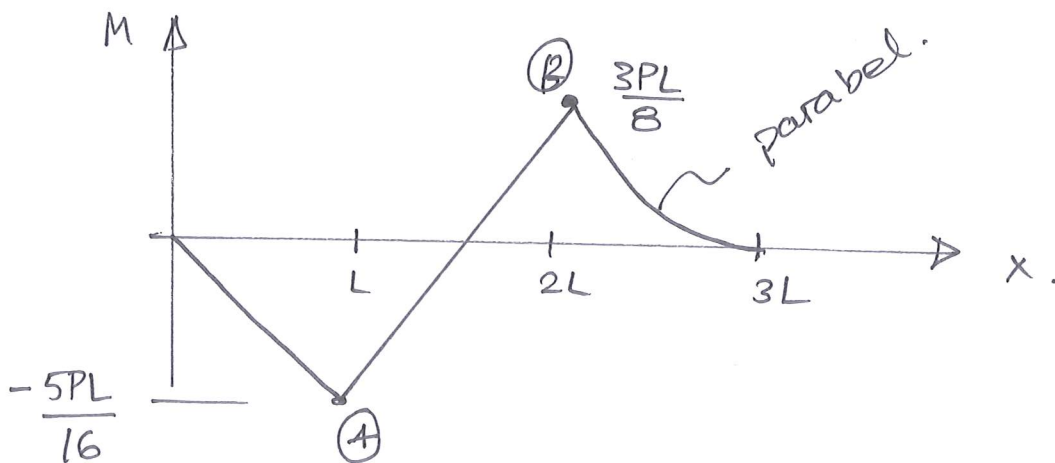
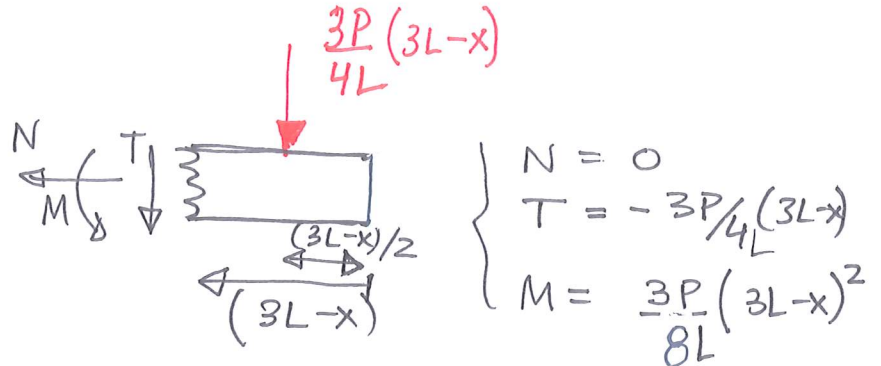
$$\begin{cases} N = 0 \\ T = -5P/16 \\ M = -5Px/16 \end{cases}$$

$$L \leq x \leq 2L.$$

$$\begin{cases} M(L) = -\frac{5PL}{16} \\ M(2L) = \frac{3PL}{8} \end{cases}$$



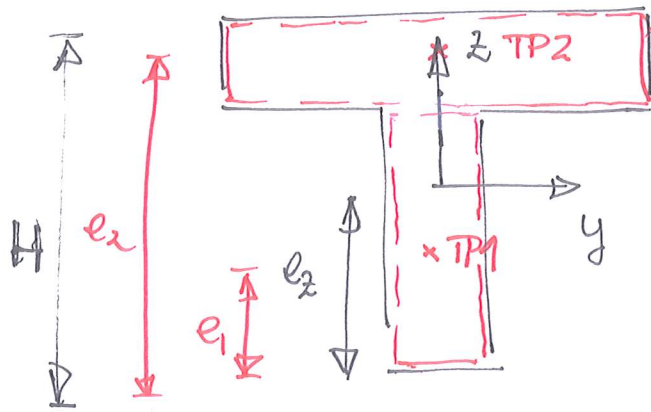
$$\begin{cases} 2L \leq x \leq 3L \\ M(2L) = \frac{3PL}{8} \\ M(3L) = 0 \end{cases}$$



3. spänningar: $\sigma = \frac{N}{A} + \frac{M}{I_y} \cdot z$ [F.S. 6.7]

Högsta spänningar sker vid (A) eller (B).

\Rightarrow Räkna ut $\begin{cases} \text{position av tyngdpunkt}(e_z) \\ I_y \end{cases}$



$$\underline{\underline{e_z = 70 \text{ mm}}}$$

[FS kap 31]

$$e_z = \frac{e_1 A_1 + e_2 A_2}{A_1 + A_2} =$$

$$= \left\{ \begin{array}{l} e_1 = 40 \text{ mm} \\ e_2 = 90 \text{ mm} \\ A_1 = 80 \times 20 \text{ mm}^2 \\ A_2 = 120 \times 20 \text{ mm}^2 \end{array} \right\} \Rightarrow$$

$$I_y = (I_1 + A_1 z_1^2 + I_2 + A_2 z_2^2) \quad [\text{FS. 29.4}]$$

$$z_1 = -e_2 + e_1 = -30 \text{ mm}$$

$$z_2 = e_2 - e_2 = 20 \text{ mm}$$

$$[\text{FS. s332}] \quad \left\{ \begin{array}{l} I_1 = \frac{20 \cdot 80^3}{12} \text{ mm}^4 \\ I_2 = \frac{120 \cdot 20^3}{12} \text{ mm}^4 \end{array} \right.$$

$$I_y = \frac{20 \cdot 80^3}{12} + 80 \cdot 20 \cdot 30^2 + \frac{120 \cdot 20^3}{12} + 120 \cdot 20 \cdot 20^2$$

$$\underline{\underline{I_y = \frac{10}{3} \cdot 10^6 \text{ mm}^4}}$$

$$X = L \left\{ \begin{aligned} \tau_{z=-e_z} &= \frac{\left(-\frac{5PL}{16}\right)(-e_z)}{I_y} = \frac{5PLE_z}{16I_y} \quad \swarrow \text{DRAG} \\ \tau_{z=H-e_z} &= \frac{\left(-\frac{5PL}{16}\right)(H-e_z)}{I_y} = -\frac{5PL(H-e_z)}{16I_y} \end{aligned} \right.$$

\nwarrow TRYCK

$$X = 2L \left\{ \begin{aligned} \tau_{z=H-e_z} &= \frac{3PL(H-e_z)}{8I_y} \quad \leftarrow \text{DRAG} \\ \tau_{z=-e_z} &= \frac{-3PLE_z}{8I_y} \quad \leftarrow \text{TRYCK} \end{aligned} \right.$$

$$X = L \left\{ \begin{aligned} \tau_{(z=-e_z)} &= 131.25 \text{ MPa.} \quad \swarrow \text{STÖRSTA DRAG.} \\ \tau_{(z=H-e_z)} &= -56.25 \text{ MPa} \end{aligned} \right.$$

$$X = 2L \left\{ \begin{aligned} \tau_{(z=H-e_z)} &= 67.5 \text{ MPa} \\ \tau_{(z=-e_z)} &= -157.5 \text{ MPa.} \end{aligned} \right.$$

\nwarrow STÖRSTA TRYCK