4.1 Odredite mjerodavne sile po teoriji plastičnosti za nosač prikazan na crtežu.

Poznato je:

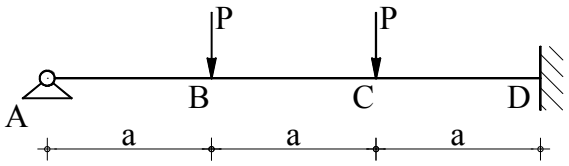
$L = 6.0\text{m}$

$a = 3.0\text{m}$

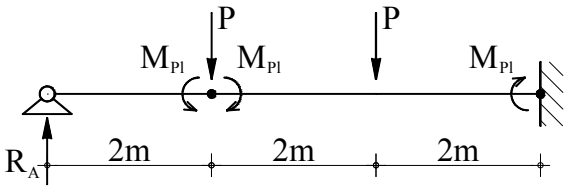
$P = 60.0\text{kN}$

$\sigma_R = 21\frac{\text{kN}}{\text{cm}^2}$

$\nu = 1.60$



Plastična ravnoteža sustava:



Uvjet za moment plastičnosti u točki B

$$R_A \cdot a = M_{Pl} \tag{1}$$

Uvjet za moment plastičnosti u točki D

$$R_A \cdot 3a - P \cdot 2a - P \cdot a = -M_{Pl} \tag{2}$$

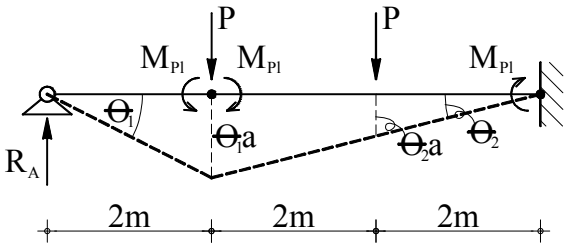
Kad uvrstimo jednadžbu (1) u jednadžbu (2) dobivamo:

$$\frac{M_{Pl}}{a} \cdot 3a - P \cdot 2a - P \cdot a = -M_{Pl}$$

$$3M_{Pl} + M_{Pl} = 3a \cdot P$$

$$M_{Pl} = \frac{3}{4} P \cdot a = 90.0\,\text{kNm}$$

Kinematski princip /princip virtualnih radova/



$$P \cdot \Theta_1 \cdot a + P \cdot \Theta_2 \cdot a - M_{Pl} \cdot \Theta_1 - 2 \cdot M_{Pl} \cdot \Theta_2 = 0$$

$$\Theta_1 = 2\Theta_2 \Rightarrow P \cdot \Theta_1 \cdot a + P \cdot \frac{\Theta_1}{2} \cdot a - M_{Pl} \cdot \Theta_1 - 2 \cdot M_{Pl} \cdot \frac{\Theta_1}{2} = 0$$

$$\frac{P(2 \cdot \Theta_1 \cdot a + \Theta_1 \cdot a)}{2} = 2M_{Pl} \cdot \Theta_1$$

$$M_{Pl} = \frac{3}{4} P \cdot a = 90.0\,\text{kNm}$$