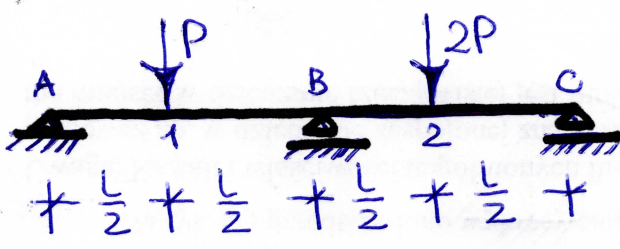


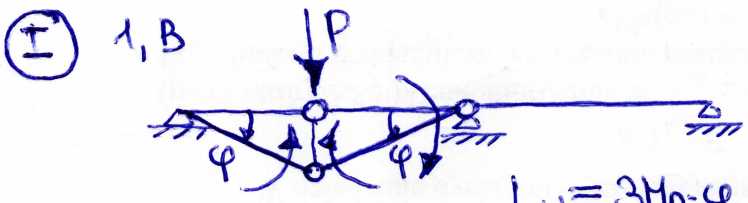
NOŚNOŚĆ GRANICZNA



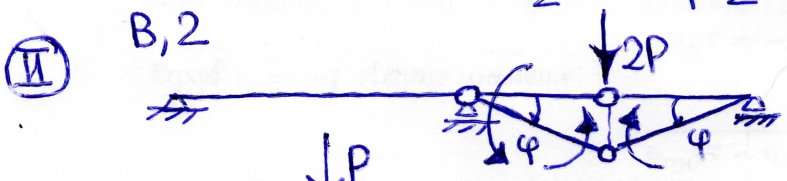
$M_p = \text{const}, EI = \text{const}$
sztic wykresu (M)



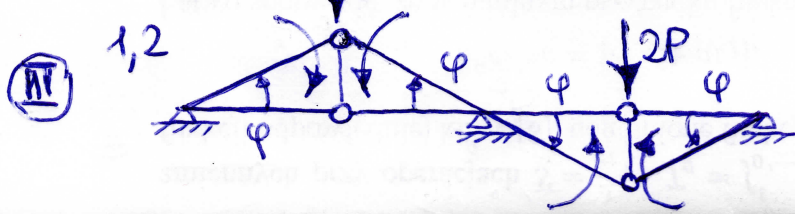
3 możliwe położenie (Mech),
2 przeguby ($n_s=1$) → 3 MECHANIZMY



$$\left. \begin{aligned} L_w &= 3M_p \cdot \varphi \\ L_z &= P \cdot \varphi \cdot \frac{L}{2} \end{aligned} \right\} L_w = L_z \Rightarrow P_I = \frac{6M_p}{L}$$



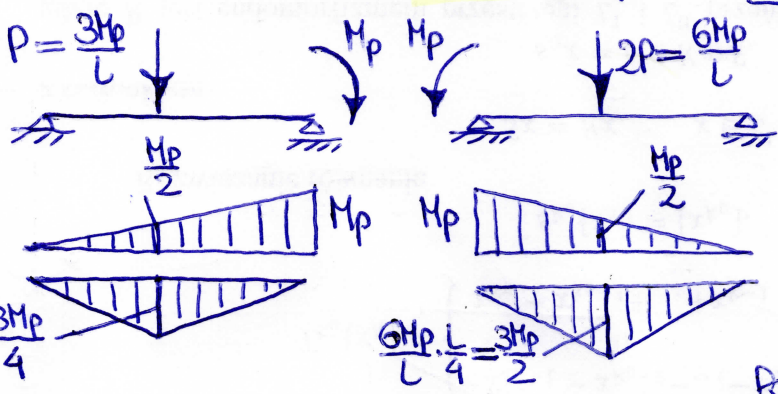
$$\left. \begin{aligned} L_w &= 3M_p \cdot \varphi \\ L_z &= 2P \cdot \varphi \cdot \frac{L}{2} = P \cdot \varphi L \end{aligned} \right\} L_w = L_z \Rightarrow P_{II} = \frac{3M_p}{L}$$



$$\left. \begin{aligned} L_w &= 4M_p \cdot \varphi \\ L_z &= 2P \cdot \varphi \cdot \frac{L}{2} - P \cdot \varphi \cdot \frac{L}{2} = P \varphi \frac{L}{2} \end{aligned} \right\} L_w = L_z \Rightarrow P_{III} = \frac{8M_p}{L}$$

minimalna wartość $P_{\min} = P_{II} = \frac{3M_p}{L}$, mechanizm (II)

Sprawdzenie, czy w punkcie (1) niebędącym przegubem plastycznym zachodzi $|M_1| \leq M_p \Rightarrow$ statyczna dopuszczalność



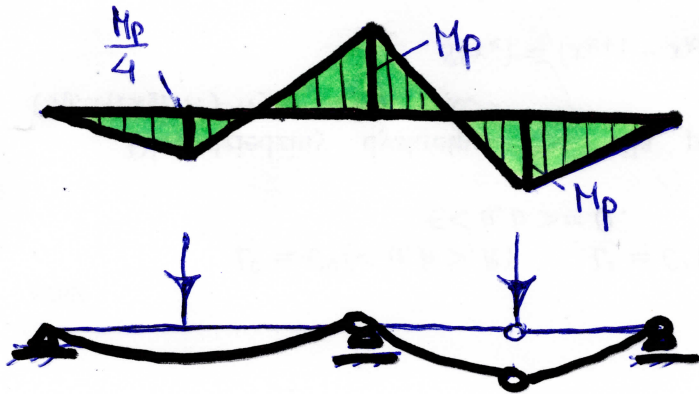
stan na chwilę przed wprowadzeniem w p. 2 przegubu - układ statycznie wyznaczalny

$$\frac{3M_p \cdot L}{L \cdot 4} = \frac{3M_p}{4}$$

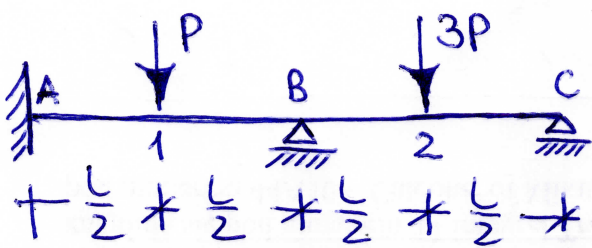
$$\frac{6M_p \cdot L}{L \cdot 4} = \frac{3M_p}{2}$$

Ponieważ $M_1 = \frac{M_p}{4} < M_p$
mechanizm jest statycznie dopuszczalny

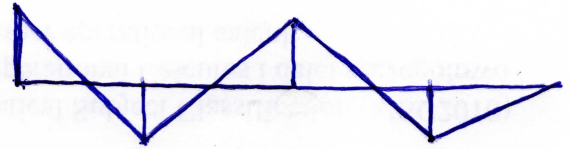
(M_{gv})



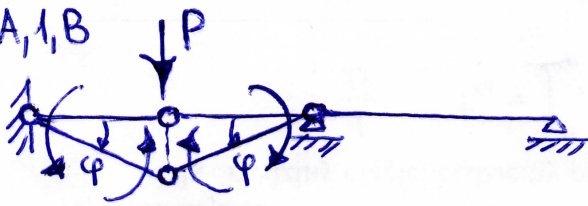
Wnio ujęcie



$M_p = \text{const}, EI = \text{const}$ 13/2



Ⓘ A, 1, B

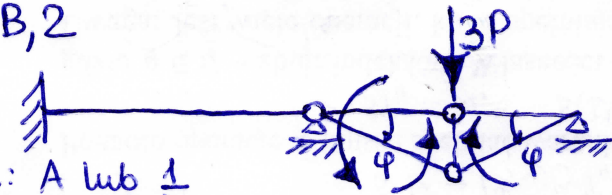


$L_w = 4M_p \cdot \varphi$
 $L_z = P\varphi \frac{L}{2}$

$L_w = L_z$
 $P_I = \frac{8M_p}{L}$

Ⓜ B, 2

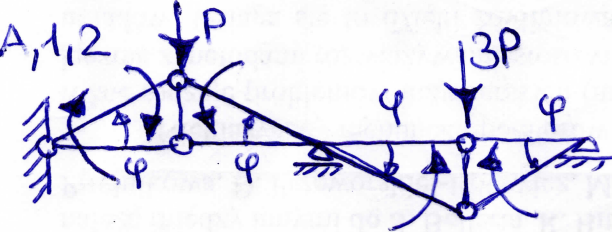
(trzeci: A lub 1
 nieaktywne)



$L_w = 3M_p \cdot \varphi$
 $L_z = 3P\varphi \cdot \frac{L}{2}$

$L_w = L_z$
 $P_{II} = \frac{2M_p}{L}$

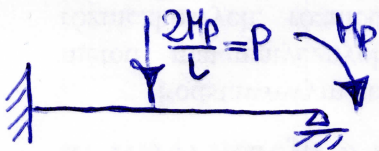
ⓓ A, 1, 2



$L_w = 5M_p \cdot \varphi$
 $L_z = 3P\varphi \frac{L}{2} - P\varphi \frac{L}{2} = P\varphi L$

$L_w = L_z$
 $P_{III} = \frac{5M_p}{L}$

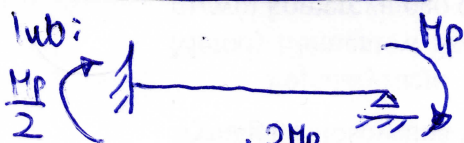
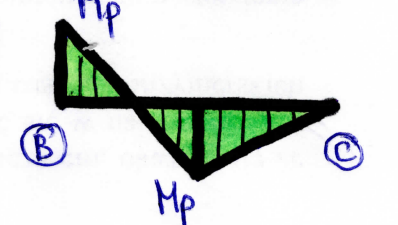
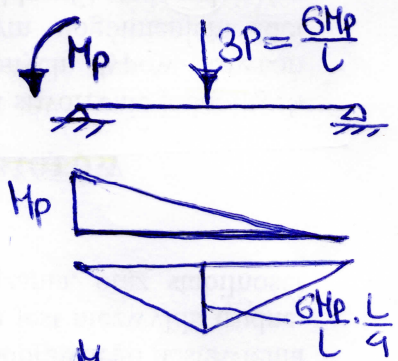
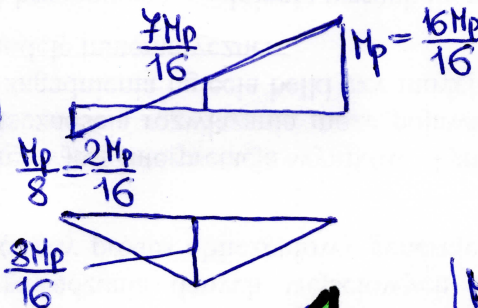
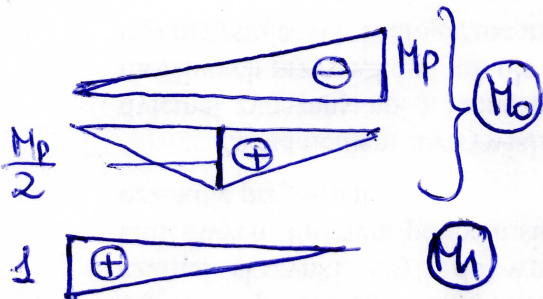
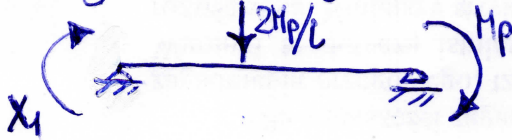
minimalna wartość $P_{min} = P_{II} = \frac{2M_p}{L}$, mechanizm II



$\delta_{10} = \frac{1}{EI} \left(\frac{1}{2}L \frac{M_p}{2} \cdot \frac{1}{2} - \frac{1}{6}L \cdot M_p \cdot 1 \right) = -\frac{M_p \cdot L}{24EI}$

$\delta_{11} = \frac{L}{3EI} \Rightarrow X_1 = \frac{M_p}{8}$

rozwiązanie metodą sił:



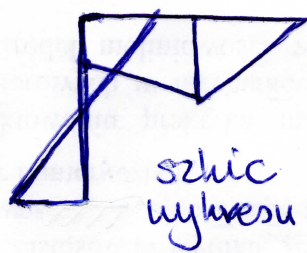
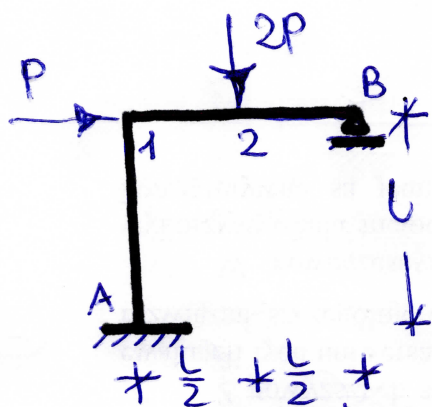
$\frac{3}{16} \cdot \frac{2M_p}{L} \cdot L = \frac{3M_p}{8}$

$M_A = \frac{M_p}{2} - \frac{3M_p}{8} = \frac{M_p}{8}$

$|M_A| = \frac{M_p}{8}$
 $|M_1| = \frac{M_p}{16}$
 $|M_2| = M_p$

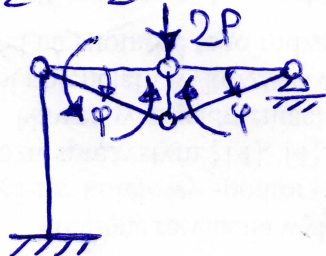
mechanizm jest statycznie dopuszczalny

$EI = \text{const}, M_p = \text{const}$



punkty A, 1, 2 → ekstremalne wartości M
 $m_s = 1 \rightarrow$ dwa przeguby
TRZY MECHANIZMY

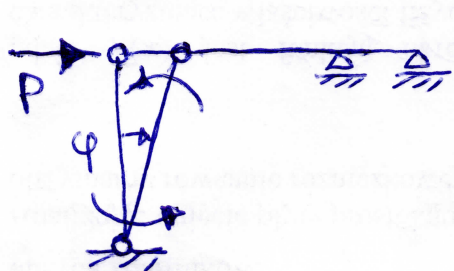
Ⓘ
1,2



$L_w = 3M_p\varphi$
 $L_z = 2P\varphi\frac{L}{2}$

$L_w = L_z \Rightarrow P_I = \frac{3M_p}{L}$

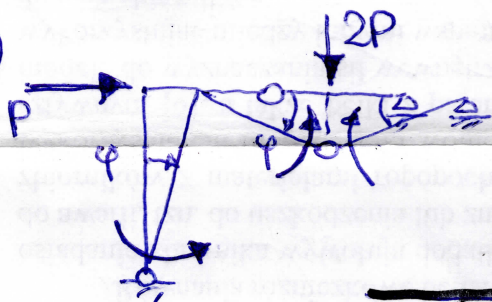
Ⓙ
A1



$L_w = 2M_p\varphi$
 $L_z = P\varphi L$

$L_w = L_z \Rightarrow P_{II} = \frac{2M_p}{L}$

Ⓜ
A2



$L_w = 3M_p\varphi$

$L_z = P\varphi L + 2P\varphi\frac{L}{2} = 2P\varphi L$

$L_w = L_z$

$P_{III} = \frac{3}{2} \frac{M_p}{L}$

minimalna wartość $P_{\min} = P_{III} = \frac{3}{2} \frac{M_p}{L}$, mechanizm III

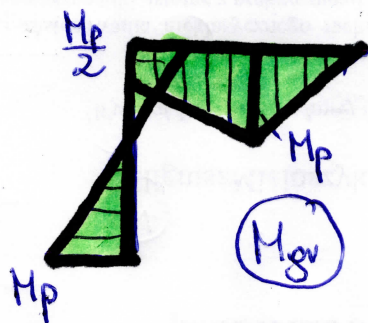
$P = \frac{3}{2} \frac{M_p}{L}$

$2P = 3 \frac{M_p}{L}$

stan na chwilę przed wprowadzeniem przegubu w p. 2

$R_B = \frac{2M_p}{L}$

$H_A = \frac{3}{2} \frac{M_p}{L}$

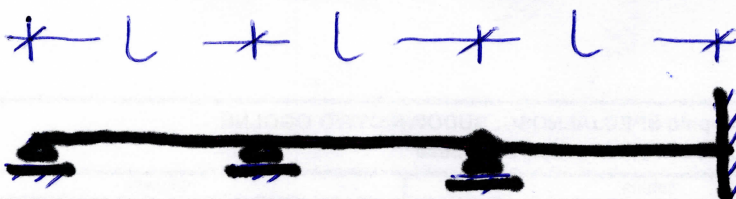


$|M_2| = \frac{2M_p}{L} \cdot \frac{L}{2} = M_p$

$|M_1| = \frac{3}{2} \frac{M_p}{L} \cdot L - M_p = \frac{M_p}{2}$

$\leq M_p$

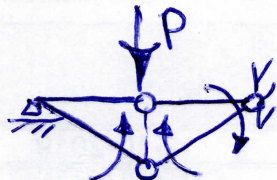
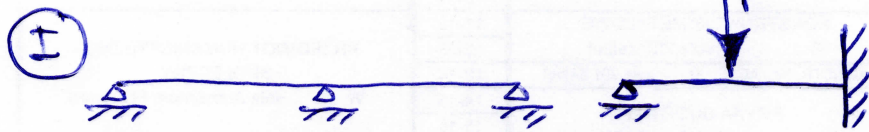
przyjęty mechanizm jest statycznie dopuszczalny



13/4

Oblinać graniczną wartość obciążenie P , które może przyjąć położenie w środku każdego z przęseł.

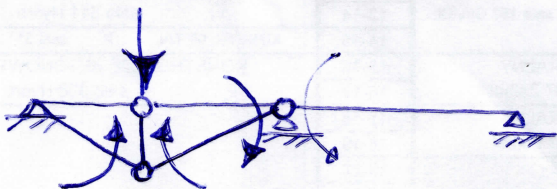
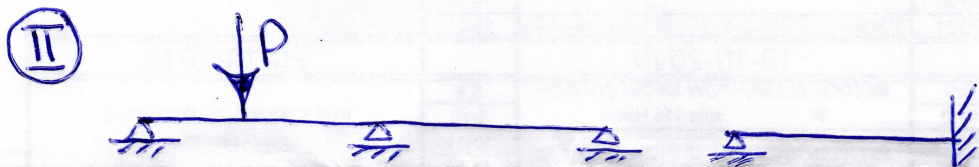
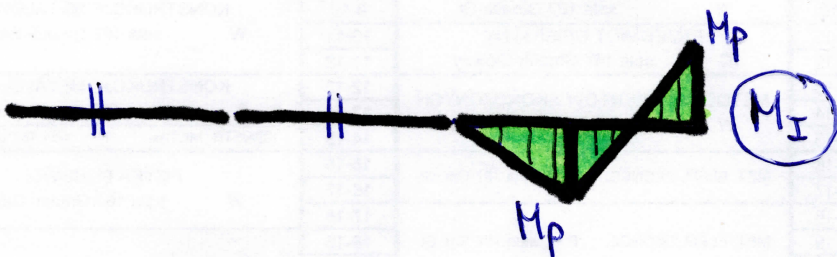
$M_p = \text{const}$ $EI = \text{const}$



$L_w = 3M_p \cdot \varphi$

$L_z = P\varphi \frac{L}{2}$

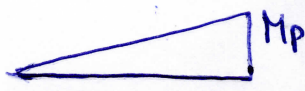
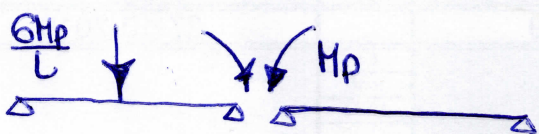
$P_I = \frac{6M_p}{L}$



$L_w = 3M_p \cdot \varphi$

$L_z = P\varphi \frac{L}{2}$

$P_{II} = \frac{6M_p}{L}$



$\frac{6M_p \cdot L}{L \cdot 4} = \frac{3M_p}{2}$

