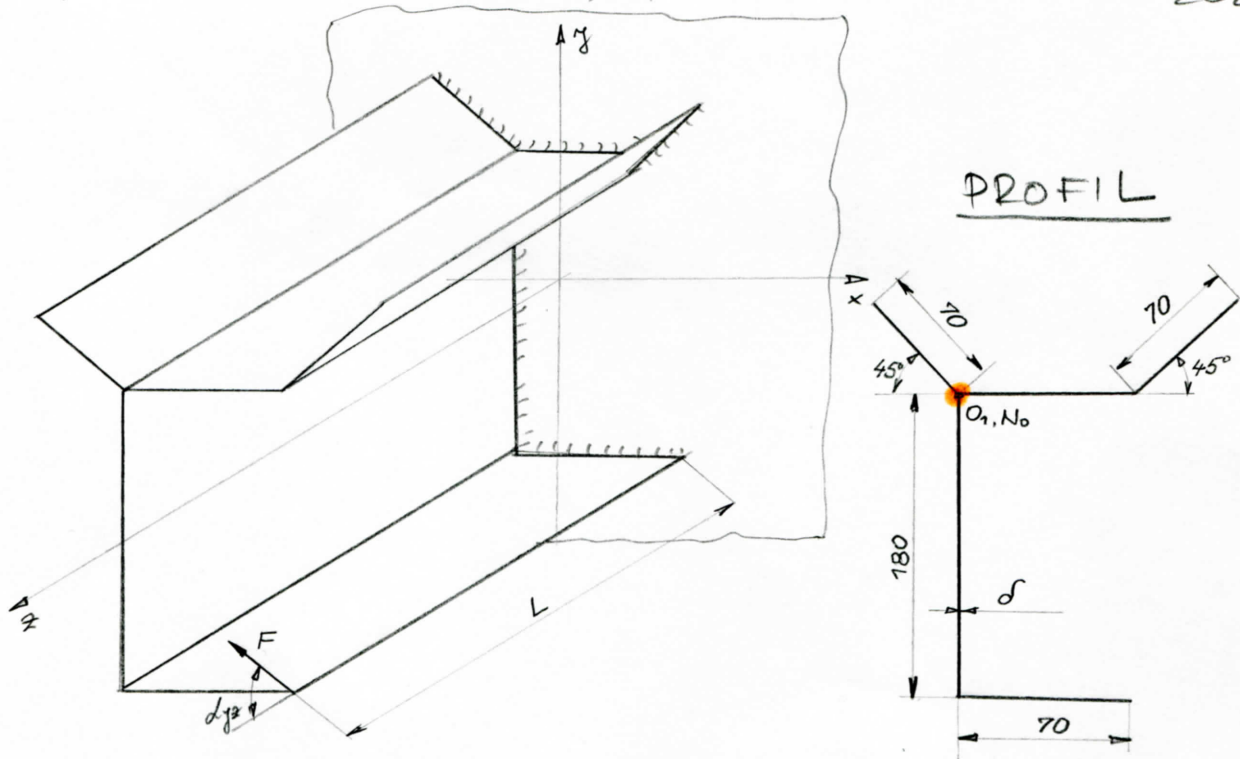


GLAVNA SEKTORSKA KOORDINATA - PRIMER NESIMETRIČNOG PROFILA -

2020.

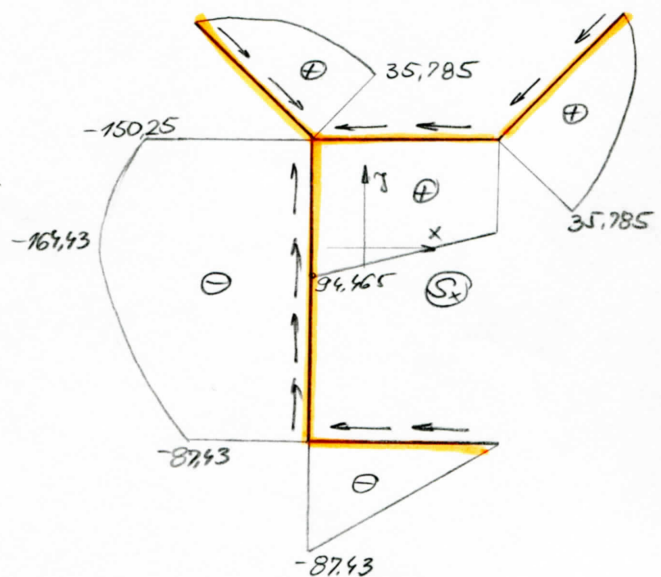
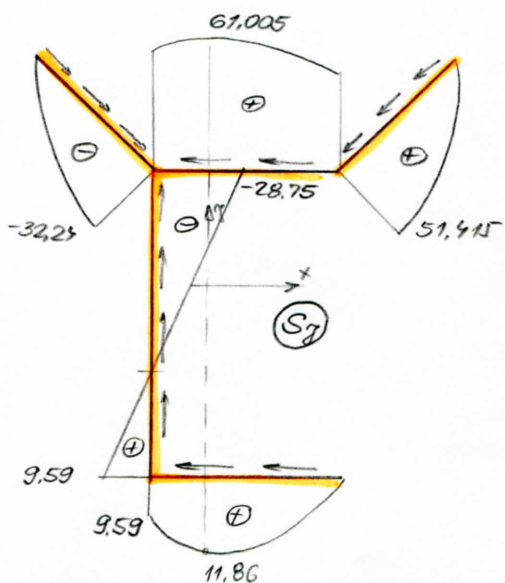
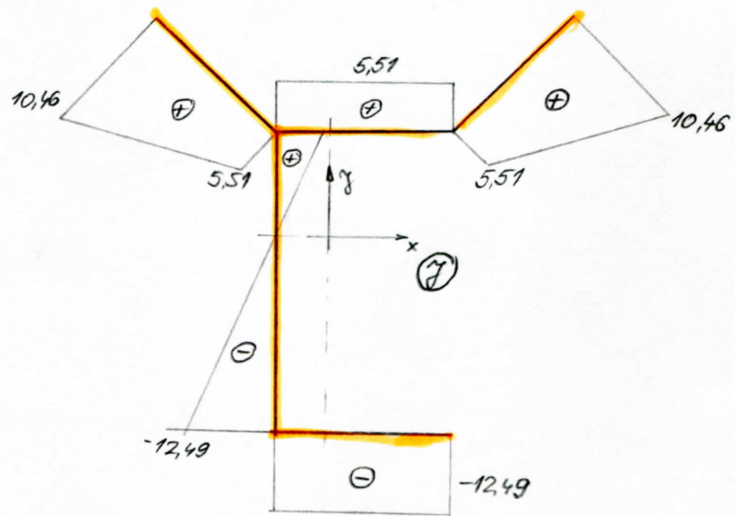
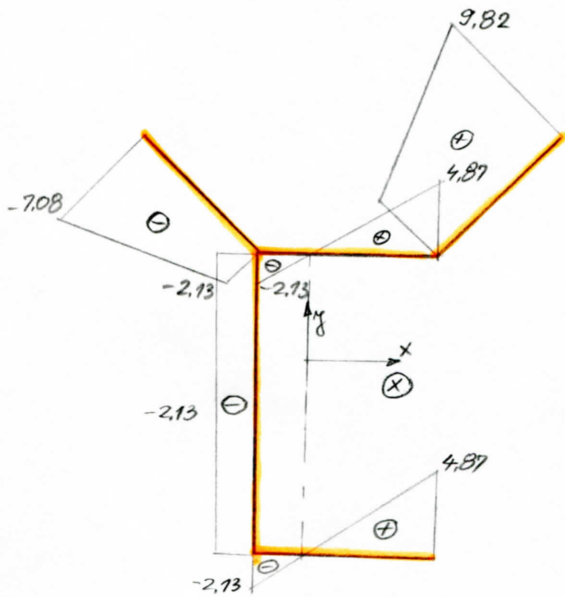
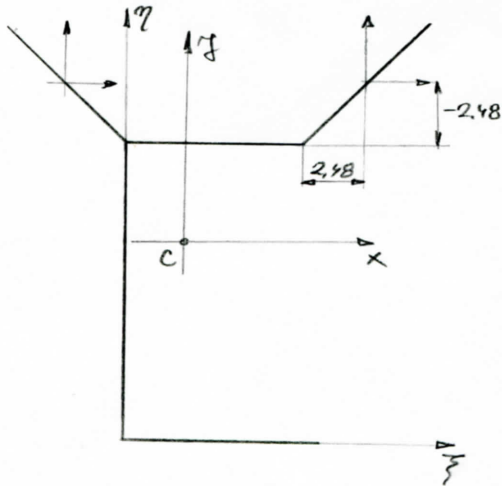


$$\begin{aligned}
 L &= 3000 \text{ mm} & \underline{\underline{\delta}} &= 10 \text{ mm} \\
 \alpha_{y2} &= 30^\circ \\
 E &= 2 \cdot 10^4 \text{ KN/cm}^2 & G &= 0,8 \cdot 10^4 \text{ KN/cm}^2 \\
 \check{C}0361 & & \delta_{\text{dep}} &= 16 \text{ KN/cm}^2
 \end{aligned}$$

$$A = 1 \cdot (4 \cdot 7 + 18) = 46 \text{ cm}^2$$

$$\bar{x}_c = \frac{\sum A_i \bar{x}_i}{\sum A_i} = \frac{1 \cdot (2 \cdot 7 \cdot 3,5 + 7 \cdot (7 + 2,48) + 7 \cdot (-2,48))}{46} = 2,13 \text{ cm}$$

$$\bar{y}_c = \frac{\sum A_i \bar{y}_i}{\sum A_i} = \frac{1 \cdot (18 \cdot 9 + 7 \cdot 18 + 2 \cdot 7 \cdot (18 + 2,48))}{46} = 12,49 \text{ cm}$$



$$S_{y1,2} = \delta \int_0^{4,87} (4,87 - s) ds = 1 \left(4,87s - \frac{s^2}{2} \right) \Big|_0^{4,87}$$

$$S_{y1} = 0 \quad ; \quad S_{y2} = 11,86 \cdot \text{м}^3$$

$$S_{y2,3} = S_{y2} + \delta \int_0^{2,13} (1 - s) ds = 11,86 - 1 \cdot \left(\frac{s^2}{2} \right) \Big|_0^{2,13} \Rightarrow S_{y3} = 9,59 \cdot \text{м}^3$$

$$S_{y3,4} = S_{y3} + \delta \int_0^{18} (-2,13) ds = 9,59 - 2,13s \Big|_0^{18} \Rightarrow S_{y4} = -28,75 \cdot \text{м}^3$$

$$S_{x1,3} = \delta \int_0^7 (-12,49) ds = 1(-12,49)s \Big|_0^7$$

$$S_{x1} = 0 \quad ; \quad S_{x3} = -87,43 \cdot \text{м}^3$$

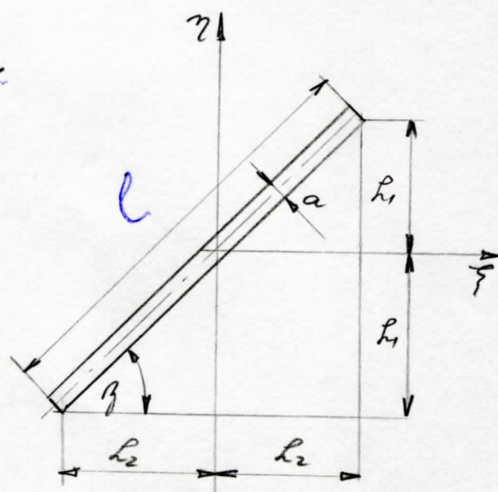
$$S_{x3,3'} = S_{x3} + \delta \int_0^{12,49} -(12,49 - s) ds = -87,43 + 1 \left(\frac{s^2}{2} - 12,49s \right) \Big|_0^{12,49}$$

$$S_{x3'} = 165,43 \cdot \text{м}^3$$

$$S_{x4} = 150,25 \cdot \text{м}^3$$

КОЧА ЛЕО

$$\begin{aligned} l &= 7 \cdot \text{м} \\ \gamma &= 45^\circ \\ a &= 1 \cdot \text{м} \end{aligned}$$



$$l_1 = \frac{l \cdot \sin \gamma}{2} \quad ; \quad l_2 = \frac{l \cdot \cos \gamma}{2}$$

$$\bar{I}_y = \frac{al^2l}{3} = \frac{al^3 \sin^2 \gamma}{12}$$

$$\bar{I}_z = \frac{al^2l}{3} = \frac{al^3 \cos^2 \gamma}{12}$$

$$\gamma = 45^\circ$$

$$\bar{I}_y = \frac{1 \cdot 7^3 \sin^2 45^\circ}{12} = 14,3 \cdot \text{м}^4$$

$$\bar{I}_z = \frac{1 \cdot 7^3 \cos^2 45^\circ}{12} = 14,3 \cdot \text{м}^4$$

по дефиниции

$$\begin{aligned} I_x &= \delta \int y^2 ds = \left[\frac{7 \cdot 1^3}{12} + 7 \cdot 1(-12,49)^2 \right] + \left[\frac{1 \cdot 18^3}{12} + 1 \cdot 18 \cdot (3,49)^2 \right] + \\ &+ \left[\frac{7 \cdot 1^3}{12} + 7 \cdot 1 \cdot (5,51)^2 \right] + 2 \left[\bar{I}_y + 1 \cdot 7 \cdot (5,51 + 3,5 \cdot \sin 45^\circ)^2 \right] \Rightarrow \end{aligned}$$

$$I_x = 2932 \cdot \text{м}^4 \quad \checkmark$$

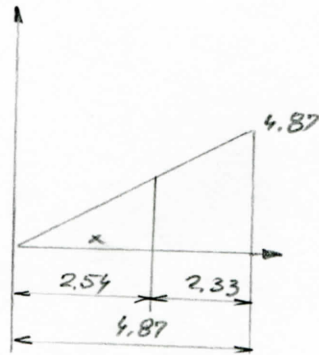
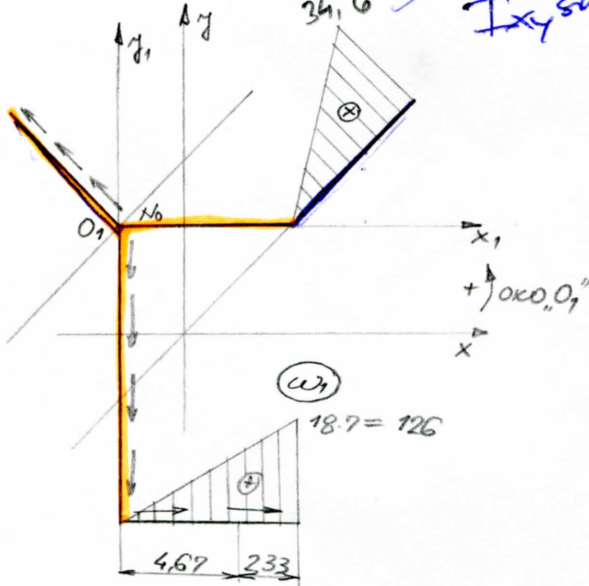
$$\begin{aligned} I_y &= \left[\frac{1 \cdot 7^3}{12} + 1 \cdot 7 \cdot (1,37)^2 \right] + \left[\frac{18 \cdot 1^3}{12} + 18 \cdot 1 \cdot (-2,31)^2 \right] + \left[\frac{1 \cdot 7^3}{12} + 1 \cdot 7 \cdot (1,37)^2 \right] + \\ &+ \left[\bar{I}_z + 1 \cdot 7 \cdot (7 + 3,5 \cos 45^\circ - 2,13)^2 \right] + \left[\bar{I}_z + 1 \cdot 7 \cdot (-3,5 \cos 45^\circ - 2,13)^2 \right] \Rightarrow \end{aligned}$$

$$I_y = 721,3 \cdot \text{м}^4 \quad \checkmark$$

$$I_{xy} = 1.7 \cdot (3.5 - 2.13) \cdot (-12.49) + 18 \cdot 1 \cdot (-2.13) \cdot (12.49 - 9) + 1.7 \cdot (3.5 - 2.3) \cdot (18 - 12.49) + 1.7 \cdot (7 + 3.5 \cos 45^\circ - 2.13) \cdot (18 - 12.49 + 3.5 \sin 45^\circ) + 1.7 \cdot (-2.13 - 3.5 \cos 45^\circ) \cdot (18 - 12.49 + 3.5 \sin 45^\circ) \Rightarrow$$

$$I_{xy} = 213.7 \text{ cm}^5$$

$I_{xy \text{ spost.}} =$



$$x : 2.54 = 4.87 : 4.87$$

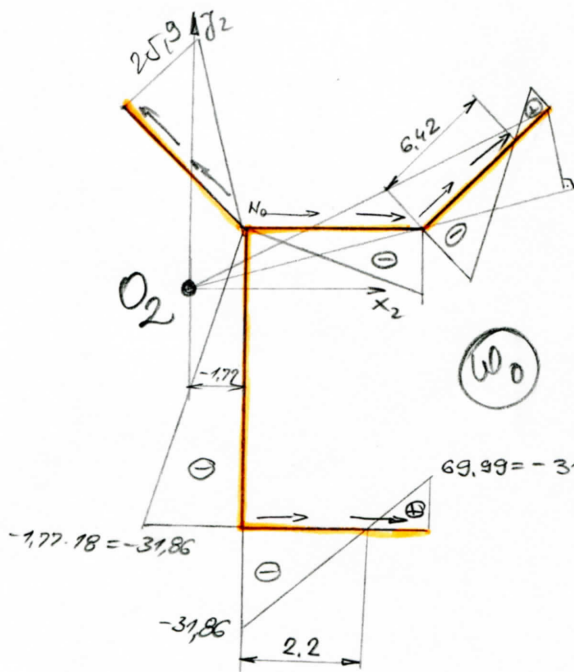
$$x = 2.54$$

$$I_{w,x} = \delta \int_S w_x x ds = 1 \left[\frac{1}{6} \cdot 34.65 (4.87 + 2 \cdot 9.82) \cdot 7 + \frac{126.7}{2} \cdot 2.54 \right] = 2110.96 \text{ cm}^5$$

$$I_{w,y} = \delta \int_S w_y y ds = 1 \left[\frac{126.7}{2} \cdot (-12.49) + \frac{1}{6} \cdot 34.65 (5.51 + 2 \cdot 10.46) \cdot 7 \right] = -4439.7 \text{ cm}^5$$

$$a = \frac{I_{w,y} \cdot I_y - I_{w,x} \cdot I_{xy}}{I_x \cdot I_y - I_{xy}^2} = -1.77 \text{ cm}$$

$$b = \frac{-I_{w,x} \cdot I_y - I_{w,y} \cdot I_{xy}}{I_x \cdot I_y - I_{xy}^2} = -3.45$$



$+ O_2$

$$-24.15 + x \cdot 3.762 = 0$$

$$x = 6.42 \text{ cm}$$

$$69.99 = -31.86 + 7(18 - 3.45)$$

$$-31.86 + x(18 - 3.45) = 0$$

$$x = 2.2$$

$$V_1 = \frac{1}{\sqrt{2}} + \frac{1,17}{\sqrt{2}} - \frac{3,46}{\sqrt{2}} = 3,76$$

$$+ 3,7 \cdot 7 = 25,9$$

$$-24,22 + V_1 (\cdot 7) =$$

- KARI DAN WO -

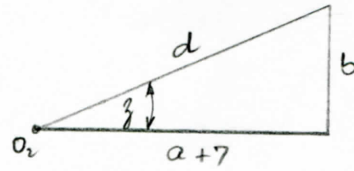
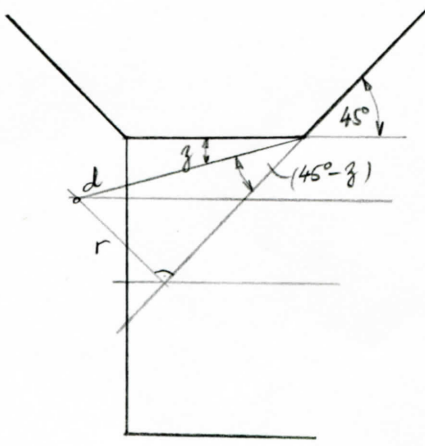


WO

$$- 1,17 \cdot 18 = - 31,86$$

$$-31,86 + (18 - 3,46) \cdot 7 = 69,92$$

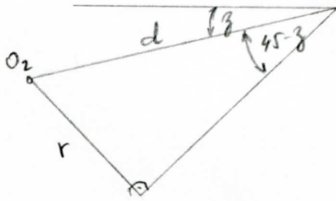
$$-31,86$$



$$d = \sqrt{(a+7)^2 + b^2} = \sqrt{8,77^2 + 3,45^2}$$

$$d = 9,42 \text{ m}$$

$$\tan \gamma = \frac{b}{a+7} = \frac{3,45}{8,77} \Rightarrow \gamma = 21,474^\circ$$

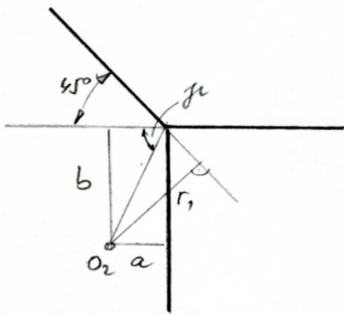


$$\sin(45 - \gamma) = \frac{r}{d} \Rightarrow r = d \sin(45 - \gamma)$$

$$r = d \sin 23,526$$

$$r = 9,424 \cdot 0,399$$

$$r = 3,762 \text{ m}$$



$$\tan \mu = \frac{b}{a} = \frac{3,45}{1,77} \Rightarrow \mu = 62,84^\circ$$

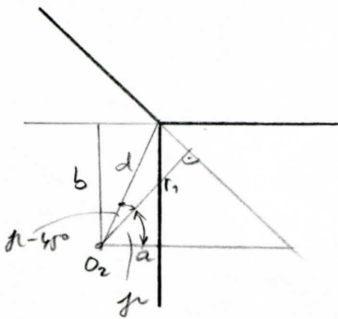
$$d = \sqrt{a^2 + b^2} = \sqrt{1,77^2 + 3,45^2} = 3,9 \text{ m}$$

$$\cos(\mu - 45^\circ) = \frac{r_1}{d}$$

$$r_1 = d \cos(\mu - 45^\circ)$$

$$r_1 = 3,9 \cdot \cos 17,84$$

$$r_1 = 3,712 \text{ m}$$

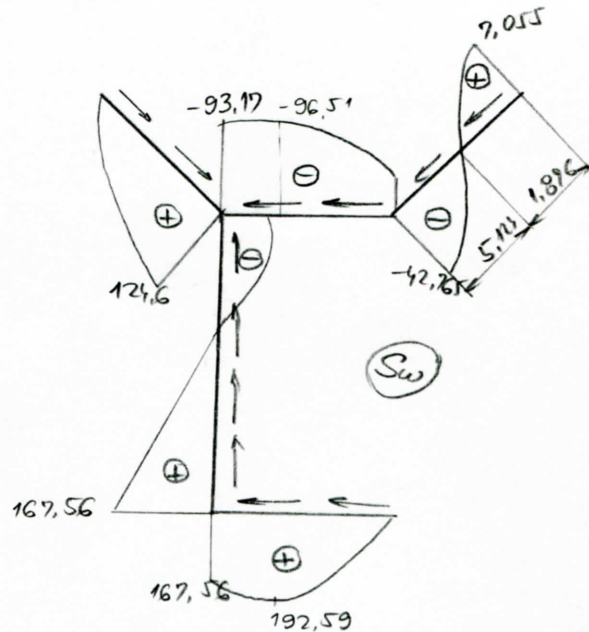
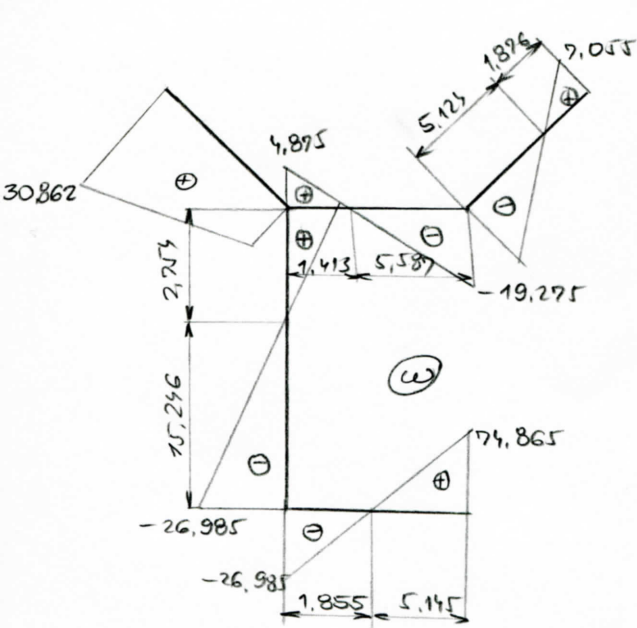


$$S_{w0} = \int_A w_0 dA = d \int_S w_0 dS$$

$$S_{w0} = 1 \cdot \left[\frac{69,99 \cdot 4,8}{2} - \frac{31,86 \cdot 2,2}{2} - \frac{31,86 \cdot 1,8}{2} - \frac{24,15 \cdot 7}{2} - \frac{24,15 \cdot 6,42}{2} + \frac{2,18 \cdot 0,58}{2} + \frac{7 \cdot 25,989}{2} \right] = -224,27 \text{ m}^3$$

$$\Rightarrow C = - \frac{S_{w0}}{A} = - \frac{(-224,27)}{46} = 4,875 \text{ m}$$

$$\boxed{w = w_0 + C}$$



$$\begin{aligned}
 -26,985 + x(18 - 3,45) &= 0 \Rightarrow x = 1,855 \text{ cm} \\
 -26,985 + x_1 \cdot 1,77 &= 0 \Rightarrow x_1 = 15,246 \text{ cm} \\
 4,875 - x_2 \cdot 3,45 &= 0 \Rightarrow x_2 = 1,413 \text{ cm} \\
 -19,275 + x_3 \cdot 3,762 &= 0 \Rightarrow x_3 = 5,124 \text{ cm}
 \end{aligned}$$

$$I_w = \int \omega \cdot \omega \, ds$$

$$\begin{aligned}
 I_w = 1 \left[\frac{7,055 \cdot 1,87}{2} \cdot \frac{2}{3} \cdot 7,055 + \frac{19,275^2 \cdot 5,13}{3} + \frac{19,275^2 \cdot 5,587}{3} + \right. \\
 + \frac{4,875^2 \cdot 1,413}{3} + 4,875 \cdot 7 \left(4,875 + \frac{1}{2} (30,862 - 4,875) \right) + \\
 + \frac{(30,862 - 4,875) \cdot 7}{2} \left(4,875 + \frac{2}{3} (30,862 - 4,875) \right) + \frac{4,875^2 \cdot 2,275}{3} + \\
 \left. + \frac{26,985^2 \cdot 15,246}{3} + \frac{26,985^2 \cdot 1,855}{3} + \frac{74,865^2 \cdot 9,514}{3} \right]
 \end{aligned}$$

$$I_w = 17774,68 \text{ cm}^6$$

$$I_t = \frac{1}{3} \sum b \cdot d^3$$

$$I_t = \frac{1}{3} 1^3 (4 \cdot 7 + 18) = 15,33 \text{ cm}^4$$