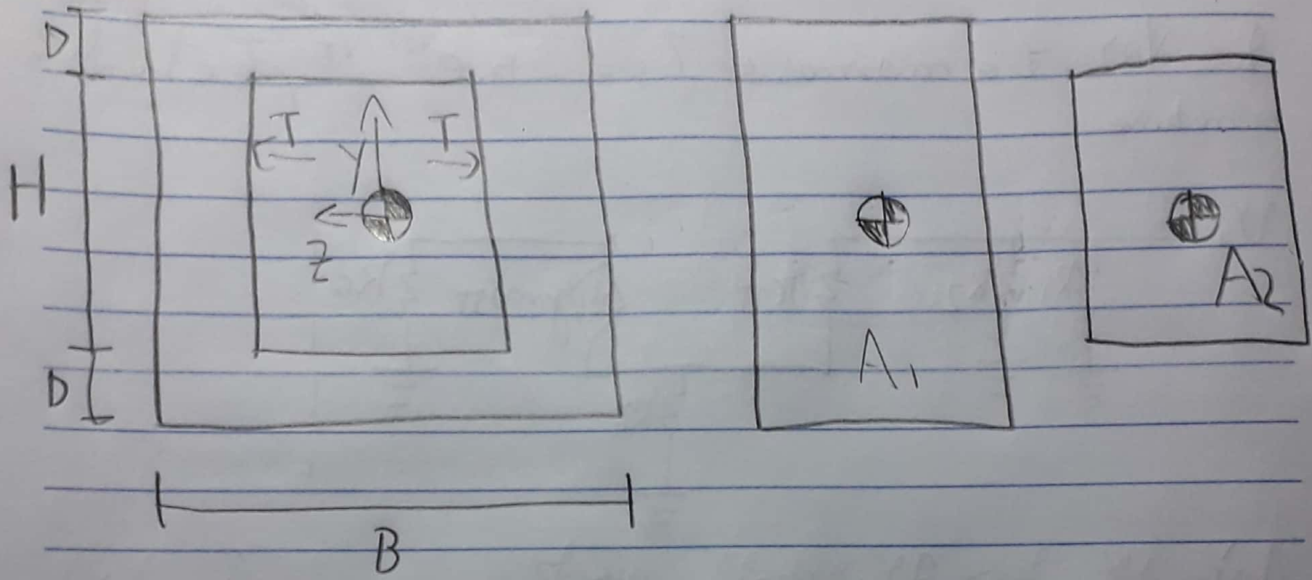
Igor Rocis Olivi 174932

Prop. Geo. 102.1a



Área da figura vazada → $A = A_1 - A_2$

$A_1 = (H+2D)B \qquad A_2 = H(B-2T)$

$A = (H+2D)B - H(B-2T) = 2(BD+HT)$

$D = T$
$H = B = 6T$

$A = 2(6T.T + 6T.T) \rightarrow A = 24T^2$

Momento de Inércia com relação a z: $I_{zz1} \ \frac{B(H+2D)^3}{12}$

$I_{zz1} = \frac{3072\,T^4}{12} = 256\,T^4$

Figura A_1

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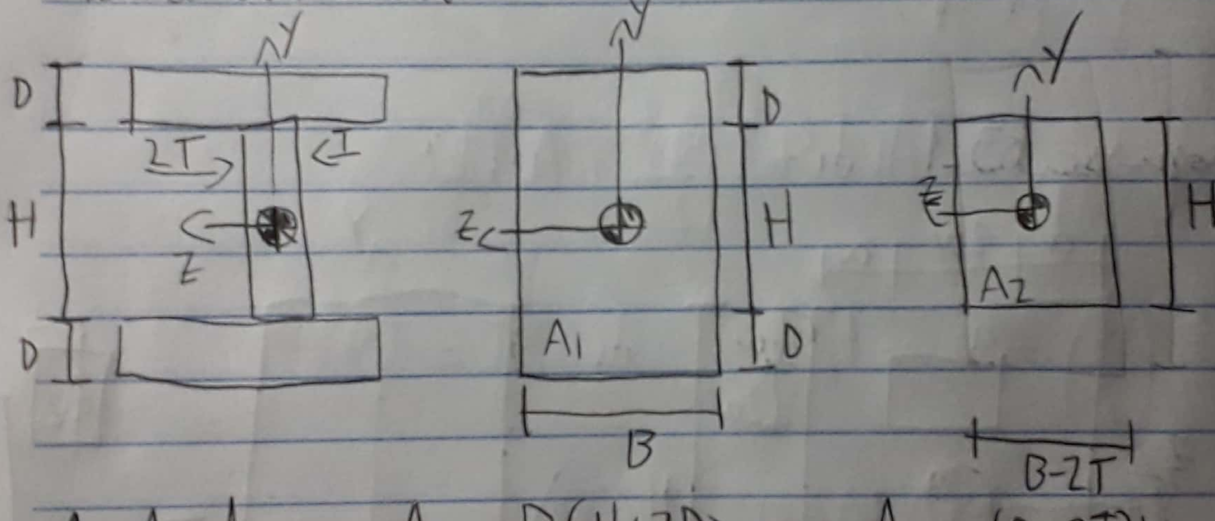
Figura A_2 $I_{zz2} = \frac{(B-2T)H^3}{12} = \frac{864T^4}{12} = 72T^4$

$I_{zz} = I_{zz1} - I_{zz2} = 256.T^4 - 72T^4 = \boxed{184T^4}$

$Y_{máx} = \left(\frac{H}{2}+D\right) = \left(\frac{6T}{2}+T\right) \to Y_{máx} = 4T$

$W_z = \frac{I_{zz}}{Y_{máx}} = \frac{184T^4}{4T} = 46T^3$

Parte da direita



$A = A_1 - A_2 \to A_1 = B(H+2D)$ $A_2 = (B-2T)H$

$A = (2D+H)B - (B-2T)H \to A = 2(DB+TH)$

$D = T$ $H = B = 6T \to A = 2(T.6T + T.6T) = 24T^2$

Simetria em Z $\to \bar{Y} = 0$

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Momento de inércia: $I_{ZZ1} = \frac{B(H+2D)^3}{12} = \frac{3072T^4}{12} = 256T^4$

$I_{ZZ2} = \frac{(B-2T)H^3}{12} = \frac{864T^4}{12} = 72T^4$

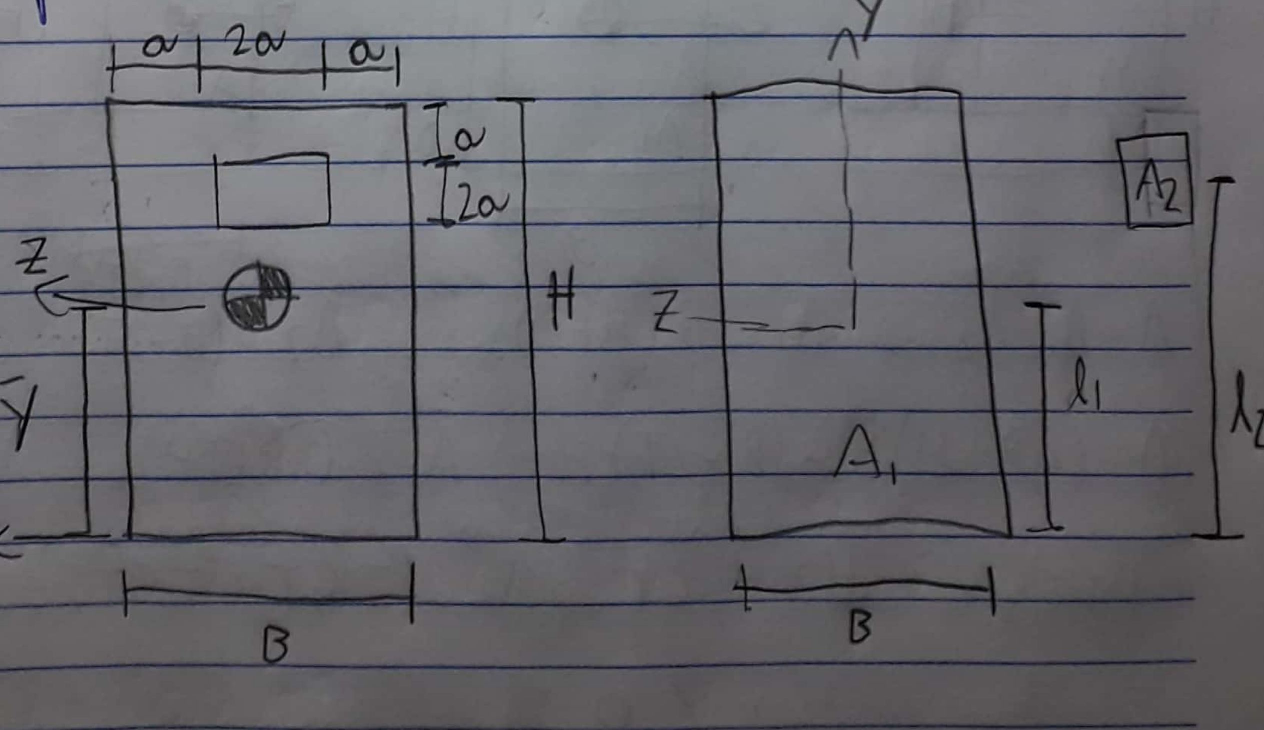
$I_{ZZ} = I_{ZZ1} - I_{ZZ2} = 184T^4$

$Y_{max} = \left(\frac{H}{2} + D\right) = \left(\frac{6T}{2} + T\right) = 4T$

$W_Z = \frac{I_{ZZ}}{Y_{max}} = \frac{184T^4}{4T} \rightarrow \boxed{W_Z = 46T^3}$

Mesmas propriedades

Prop_sec 03_1



$A = A_1 - A_2 = BH - (2a)^2 \rightarrow H = 8a,\ B = 4a,\ H = 2$

$A = 8a \cdot 4a - 4a^2 = 28a^2$

Para achar o centro geométrico

$$\bar{y} = \frac{A_1 \cdot l_1 - A_2 \cdot l_2}{A} = \left(32a^2 \frac{H}{2} - 4a^2(H - (a+a))\right)\frac{1}{28a^2}$$

$$\bar{y} = \frac{1}{7}\left(\frac{8a8}{2} - 8a + 2a\right) = \frac{26a}{7}$$

Achando os momentos de Inércia

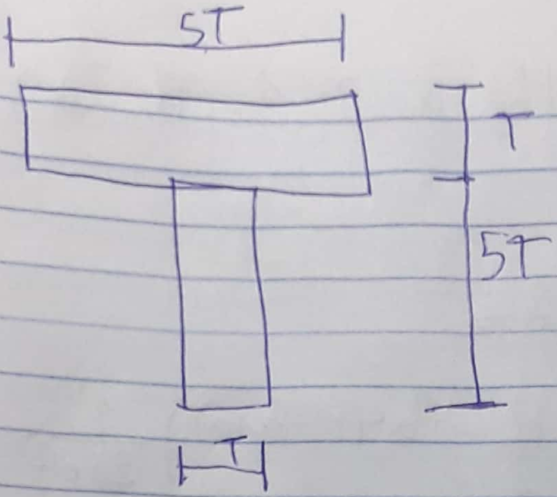
$$I_{zz1} = \frac{BH^3}{12} = \frac{4a(8a)^3}{12} = \frac{512a^4}{3}$$

$$I_{zz2} = \frac{2a(2a)^3}{12} = \frac{4a^4}{3}$$

$$I_{zz} = I_{zz1} - I_{zz2} = \frac{512a^4}{3} - \frac{4a^4}{3} = \frac{508a^4}{3}$$

$$Y_{max} = \frac{H}{2} = 4a \rightarrow W_T = \frac{I_{zz}}{Y_{max}} = \frac{508a^4}{3 \cdot 4a} \rightarrow \boxed{W_T = \frac{127a^3}{3}}$$

Prop_tec_08



$A = A_1 + A_2$
$A_1 = 5T^2$
$A_2 = 5T^2$
$A = 10T^2$

Centro geométrico: $d_p = 4T$

$$d_p A = A_1\left(5T + \frac{T}{2}\right) + A_2\left(\frac{5T}{2}\right)$$

Momento de Inércia

$$I_{ZZ} = \frac{5T(T)^3}{12} + A_1 \cdot d_1^2 + \frac{T(5T)^3}{12} + A_2(d_2)^2$$

$$d_2 = \left(\frac{5T}{2}\right) - d_p = -1{,}5T \qquad d_1 = \frac{3T}{2} = 1{,}5T$$

$$A_1 \cdot d_1 + A_2 \cdot d_2 = 5T^2 \cdot \frac{3T}{2} + 5T^2\left(\frac{-3T}{2}\right) = 0$$

$$I_{ZZ} = \frac{5T(T^3)}{12} + 5T^2\left(\frac{3T}{2}\right)^2 + \frac{T(5T)^3}{12} + 5T^2\left(\frac{3T}{2}\right)^2$$

$$I_{ZZ} = \frac{100}{3}T^4$$

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$-d_p = -4T \rightarrow d_b = 5T + T - d_p = 5T + T - 4T = 2T$

$Y_{max} = -d_p = -4T \rightarrow W_z = \frac{400T^4}{12} \cdot \frac{1}{4T} = \frac{25}{3} T^3$

Valores numéricos, como $T = 50mm$

$A = 10 \cdot T^2 = 25000 \; mm^2$

$I_{zz} = \frac{100 \cdot T^4}{3} = 208{,}33 \cdot 10^6 \; mm^2$

$W_z = \frac{25T^3}{3} = 1041666{,}67 \; mm^2$

$d_p = 4T = 200 \; mm$

$d_b = 2T = 100 \; mm$

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