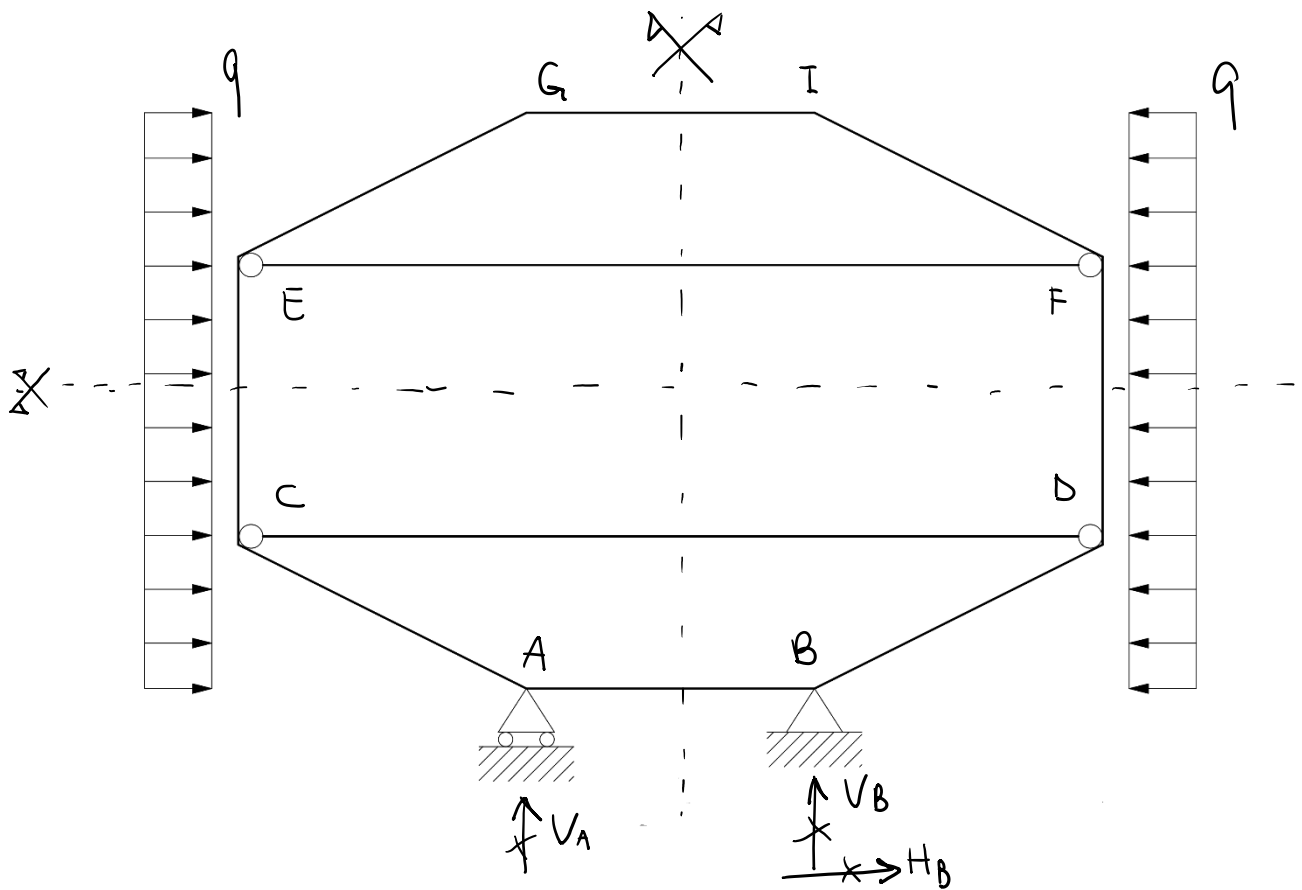


COMPITO TOTALE SdC

10/07/19

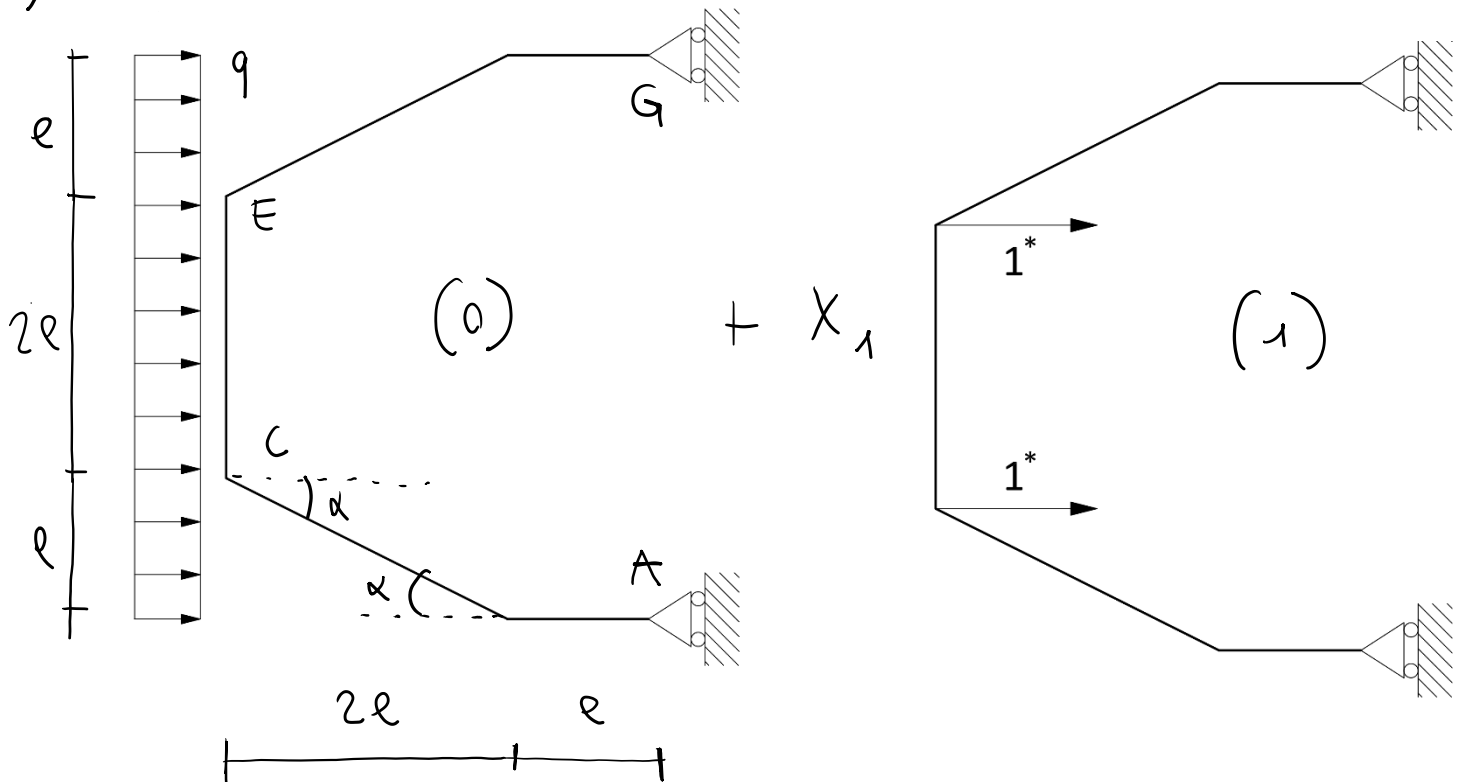


$$q = 5000 \text{ N/m}$$

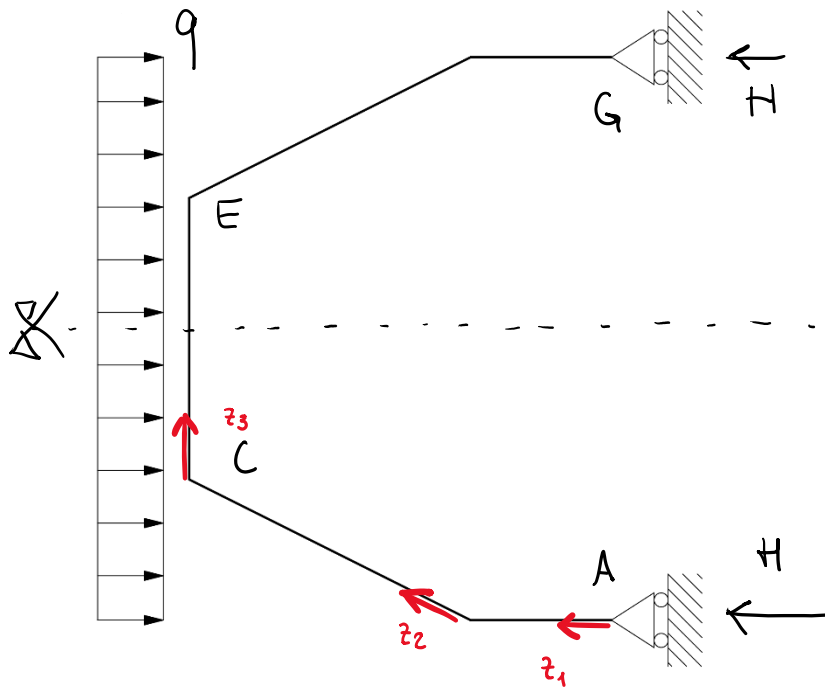
$$l = 3 \text{ m}$$

$$\alpha = \arctan(1/2)$$

1)

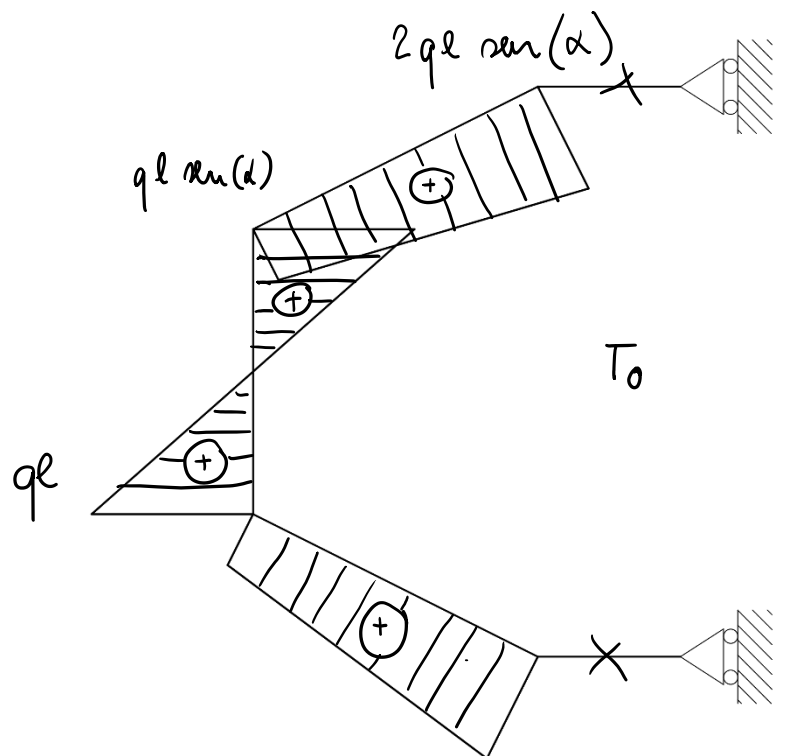
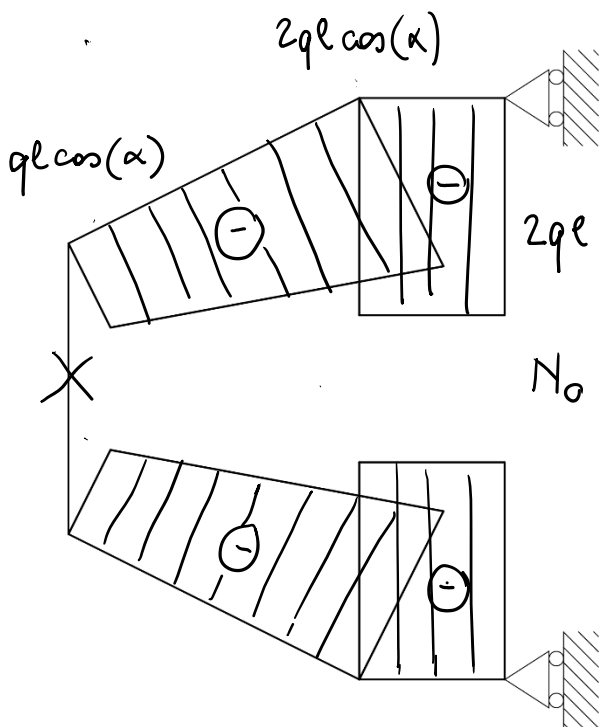


SISTEMA (c)



$$\rightarrow) 4ql - 2H = 0$$

$$H = 2ql$$



$$N_o(z_1) = -2ql$$

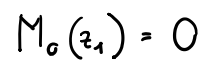
$$N_o(z_2) = -2ql \cos(\alpha) + ql \sin(\alpha) \cos(\alpha)$$

$$N_o(z_3) = 0$$

$$T_o(z_1) = 0$$

$$T_o(z_2) = 2ql \sin(\alpha) - ql \sin^2(\alpha)$$

$$T_o(z_3) = 2ql - q(e+z)$$



$$M_0(z_3) = 2ql(l+z) - \frac{q(l+z)}{2}$$

$$N_1(z_1) = -1$$

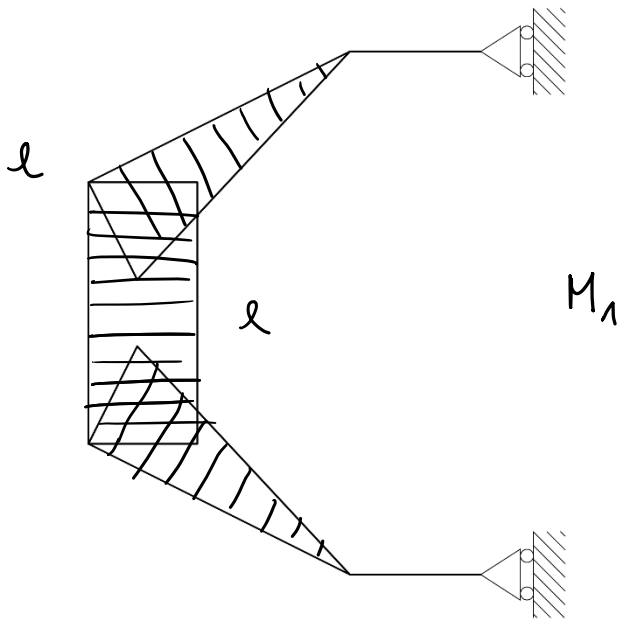
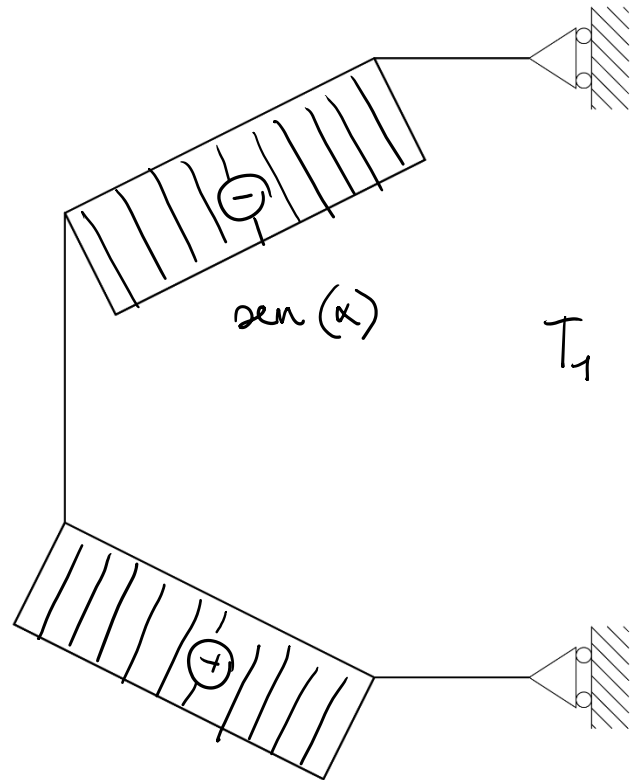
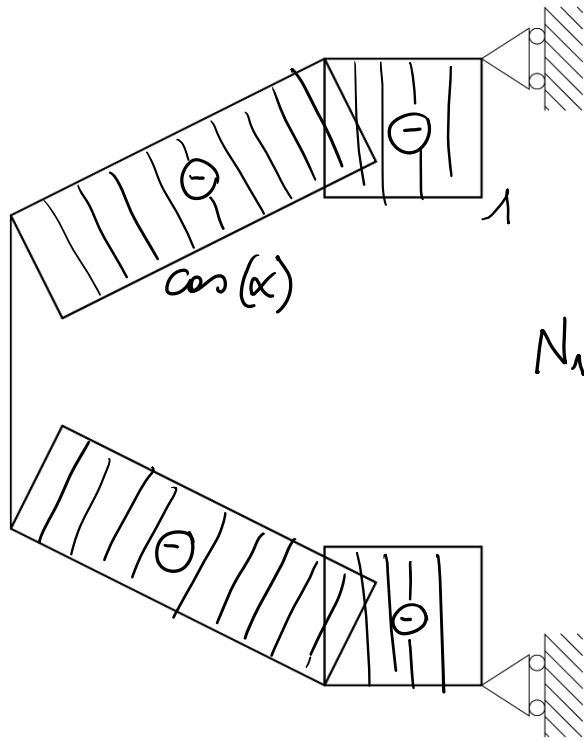
$$N_1(z_1) = -\cos(\alpha)$$

$$N_1(z_3) = 0$$

$$T_1(z_1) = 0$$

$$T_1(z_2) = \sin(\alpha)$$

$$T_1(z_3) = 0$$



$$M_1(z_1) = 0$$

$$M_1(z_2) = z \sin(\alpha)$$

$$M_1(z_3) = l$$

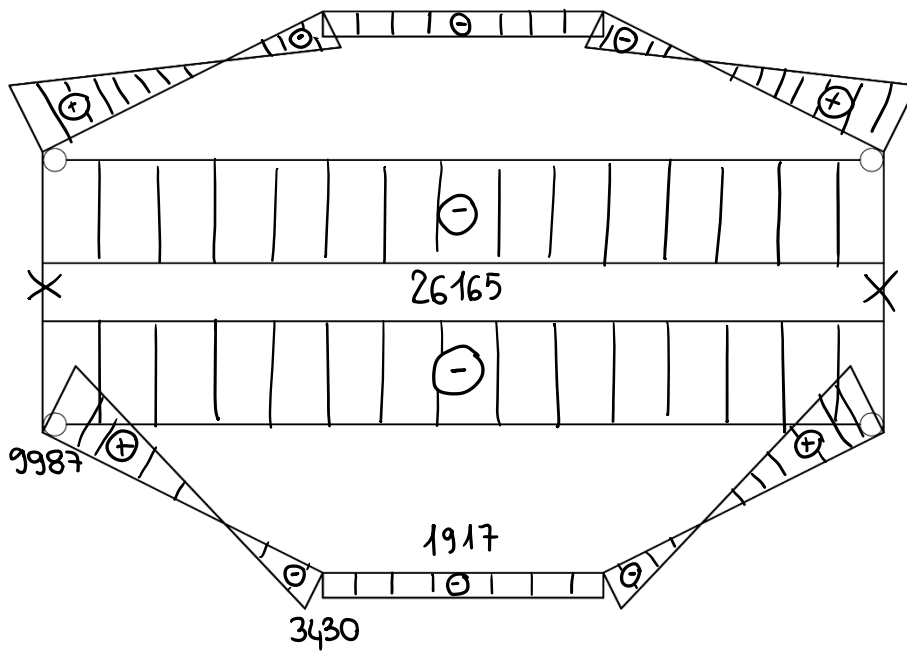
$$\eta_{10} = \frac{2}{EJ} \left[\int_0^{\frac{2l}{\cos \alpha}} \left(z \sin(\alpha) \right) \left(2qlz \sin(\alpha) - \frac{q(z \sin(\alpha))^2}{2} \right) dz + \int_0^l \left(2ql(l+z) - \frac{q(l+z)^2}{2} \right) dz \right] =$$

$$= \frac{11}{3} ql^4 + \frac{13}{12} \sqrt{2} ql^4$$

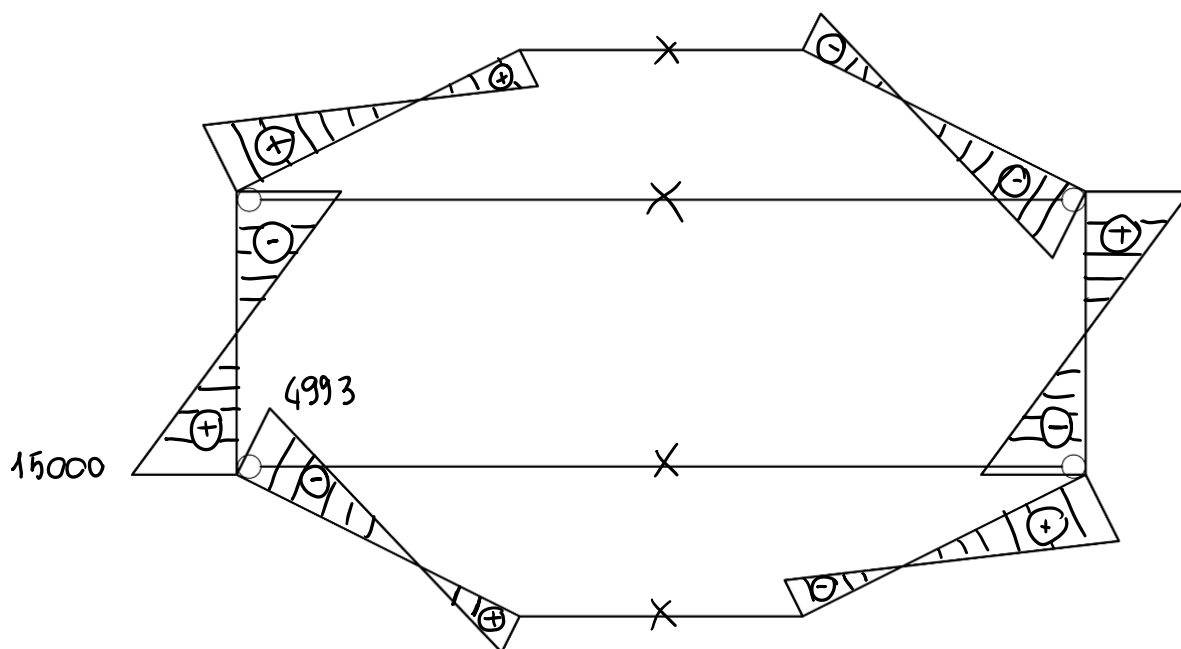
$$\eta_{11} = \frac{2}{EJ} \left[\int_0^{\frac{2l}{\cos \alpha}} \left(z \sin(\alpha) \right)^2 dz + \int_0^l l^2 dz \right] = \frac{2l^3}{EJ}$$

$$X_1 = -\frac{\eta_{10}}{\eta_{11}}$$

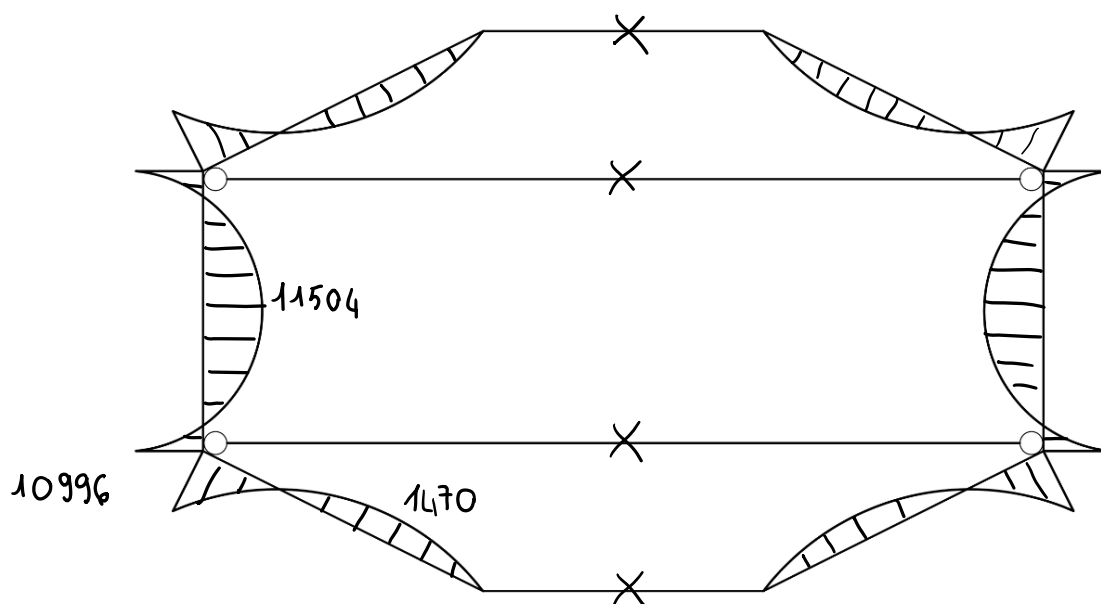
$$= -26165 \text{ N}$$



$N[N]$



$T[N]$



$M[N_m]$

$$2) M_c = -10998 \text{ Nm}$$

$$N_c = 9987 \text{ N}$$

$$T_c = 4993 \text{ N}$$

$$E = 210\,000 \text{ MPa}$$

$$\sigma_{arm} = 190 \text{ MPa}$$

SEMI PROGETTO

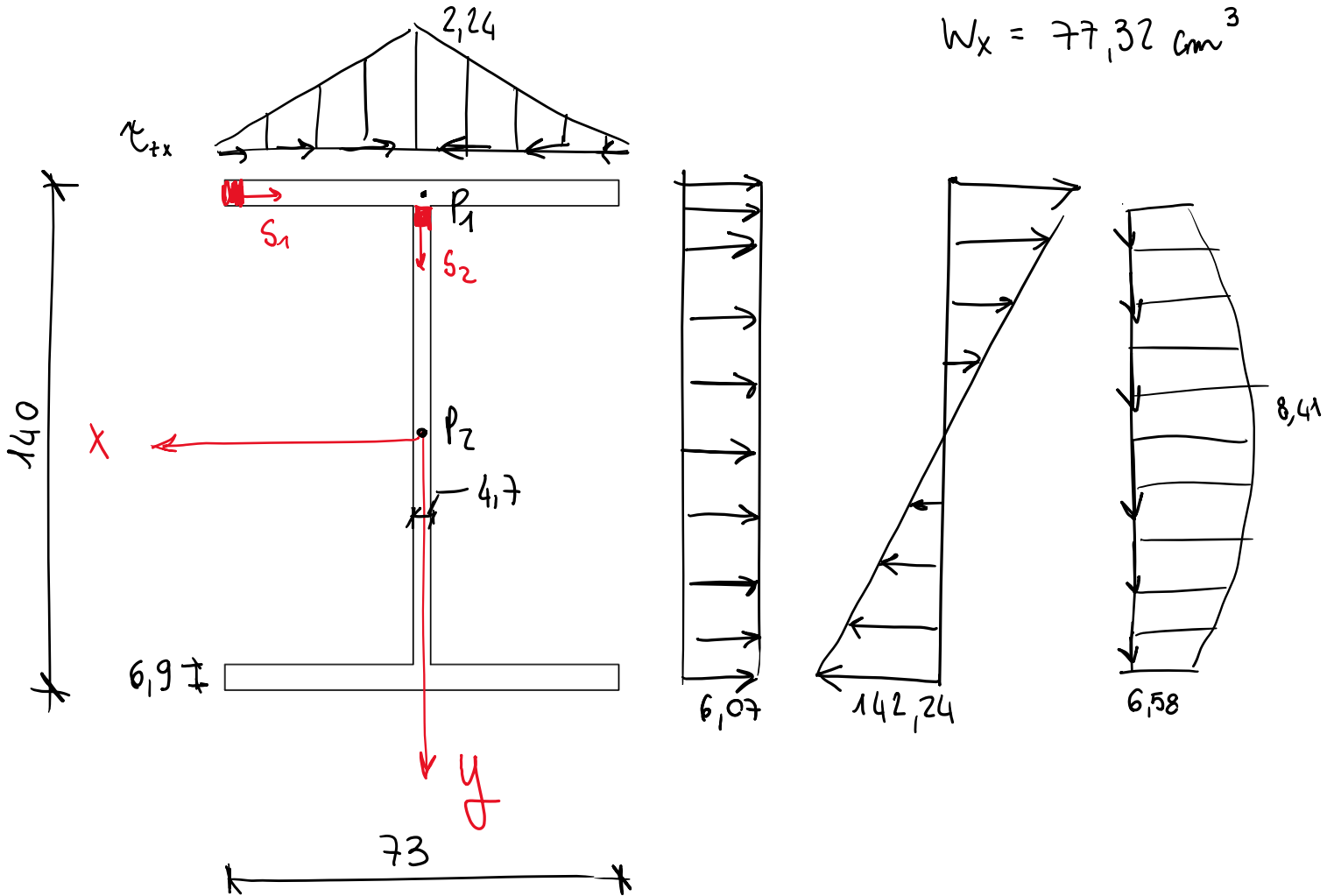
$$W_{min} = \frac{M}{\sigma_{am}} = \frac{10998}{190} = 60,7 \text{ cm}^3$$

. ADOTTO IPE 140

$$A = 16,43 \text{ cm}^2$$

$$J_x = 541,2 \text{ cm}^4$$

$$W_x = 77,32 \text{ cm}^3$$



$$\sigma_7 = \frac{N}{A} \pm \frac{M}{W} = \frac{9987}{1643} \pm \frac{-10998}{77,32} = 6,07 \pm -142,24 \text{ MPa}$$

$$\tau_{TS} = - \frac{T_y S_x^*(s)}{b_s T_x}$$

$$\tau_{zx, \max} = - \frac{T_y S_x^* (s_1 = 73/2)}{b_{s_1} J_x} = - \frac{4993 \cdot (6,9 \cdot 73 \cdot 0,5 \cdot (-70 + 3,45))}{6,9 \cdot 5412000} = 2,24 \text{ MPa}$$

$$\tau_{zy, \min}(s_2=0) = - \frac{4993 \cdot (6,9 \cdot 73 \cdot (-66,55))}{4,7 \cdot 5412000} = 6,58 \text{ MPa}$$

$$\tau_{zy, \max}(s_2=63,1) = - \frac{4993 \cdot (6,9 \cdot 73 \cdot (-66,55) + 4,7 \cdot 63,1 \cdot (-63,1 \cdot 0,5))}{4,7 \cdot 5412000}$$

$$= 8,41 \text{ MPa}$$

$$\sigma_{id, p_1} = \sqrt{\sigma_{z, p_1}^2 + 3 \cdot \tau_{zs, p_1}^2} = \sqrt{148,31^2 + 3 \cdot 6,58^2} = 149 < 190 \text{ MPa}$$

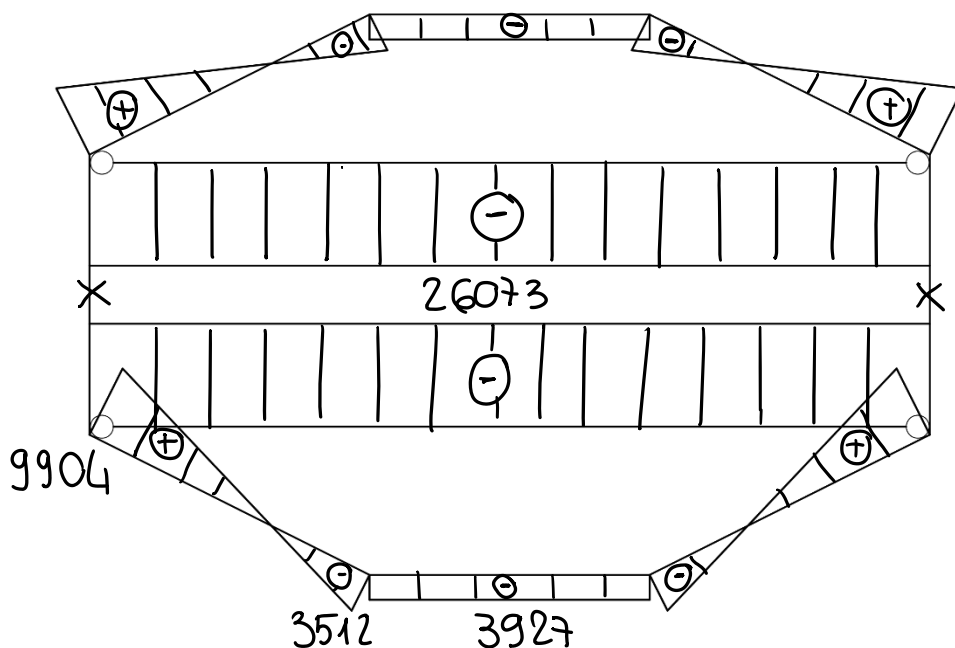
$$\sigma_{id, p_2} = \sqrt{6107^2 + 3 \cdot 8,41^2} = 15,8 < 190 \text{ MPa}$$

$$3) \quad M_{11}^N = \frac{2}{EA} \int_0^{3l} 1^2 dz = \frac{6l}{EA}$$

$$M_{11}^{Tot} = M_{11} + M_{11}^N$$

$$M_{11}^{Tot} \cdot X + M_{10} + 2 \cdot \int_0^{3l} 1,2 \cdot 10^{-5} \cdot (-30) dz = 0$$

$$X = -26073 \text{ N}$$



N [N]

