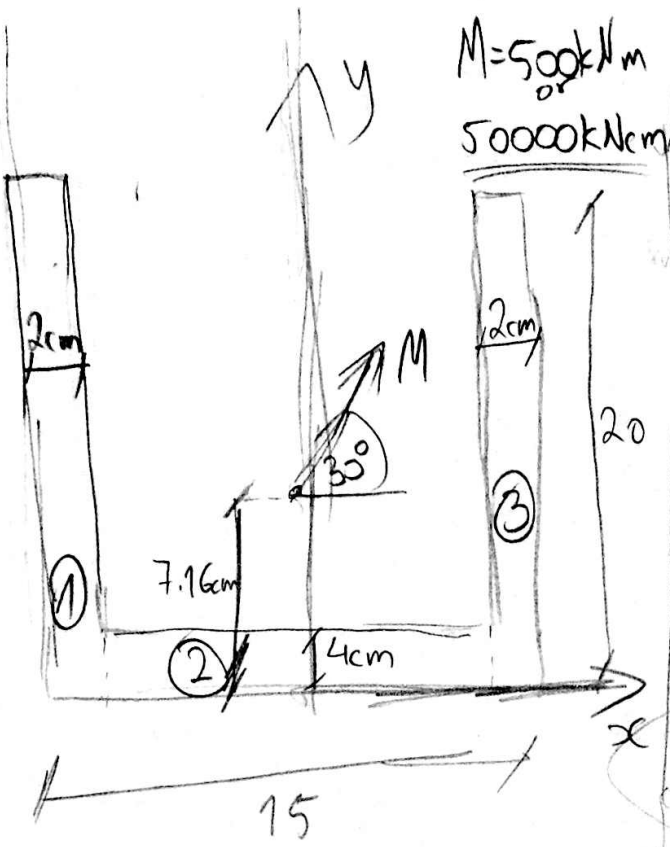


$$y_c = \frac{Sx_{TOTAL}}{A_{TOTAL}}$$

$$A_{TOTAL} = A_1 + A_2 + A_3$$
$$= 2(20) + 11(4) + 2(20) = 124\,cm^2$$

$$Sx_{TOTAL} = Sx_1 + Sx_2 + Sx_3$$
$$= 40(10) + 44(2) + 40(10) = 888\,cm^3$$

$$y_c = \frac{888}{124} = 7.16\,cm$$

Centroid = (0, 7.16)

$$I_{x_{TOTAL}} = \left[\frac{1}{12}(2)(20)^3 + 40(2.84)^2\right] + \left[\frac{1}{12}(11)(4)^3 + 44(5.16)^2\right] + \left[\frac{1}{12}(2)(20)^3 + 40(2.84)^2\right]$$
$$= 1655.96 + 1230.19 + 1655.96 = 4542.11\,cm^4$$

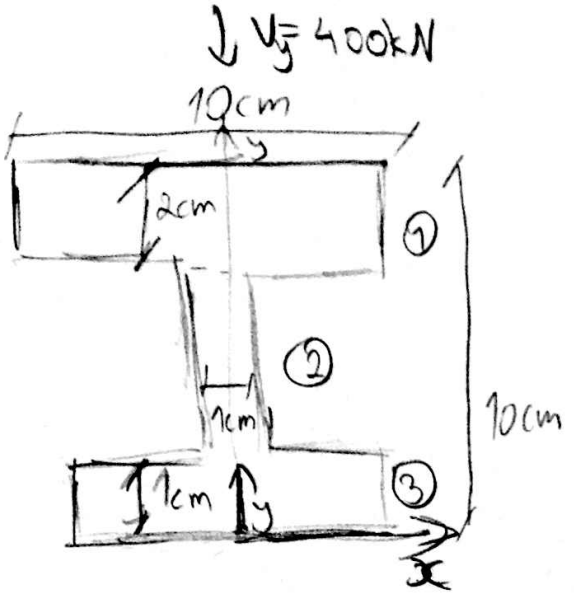
$$I_{y_{TOTAL}} = \left[\frac{1}{12}(20)(2)^3 + 40(6.5)^2\right] + \left[\frac{1}{12}(4)(11)^3 + 44(0)^2\right] + \left[\frac{1}{12}(20)(2)^3 + 40(6.5)^2\right]$$
$$= 1703.33 + 443.67 + 1703.33 = 3850.33\,cm^4$$

$$\sigma = \frac{N}{A} + \frac{M_x}{I_x}y - \frac{M_y}{I_y}x = 0$$

$M_y = (50000)\sin 30 = 25000\,kNcm$
$M_x = (50000)\cos 30 = 43301.27\,kNcm$
$I_x = 4542.11\,cm^4$
$I_y = 3850.33\,cm^4$

$$\sigma_z = \frac{43301.27}{4542.11}y - \frac{25,000}{3850.33}x = 0$$

$$\sigma_z = (9.53)y - (6.49)x = 0$$



$$y_c = \frac{S_{x_{TOTAL}}}{A_{TOTAL}}$$

$A_{TOTAL} = A_1 + A_2 + A_3 = 2(10) + 1(7) + 1(10) = 37\,cm^2$

$S_{x_{TOTAL}} = 20(9) + 7(4.5) + 10(0.5) = 216.5\,cm^2$

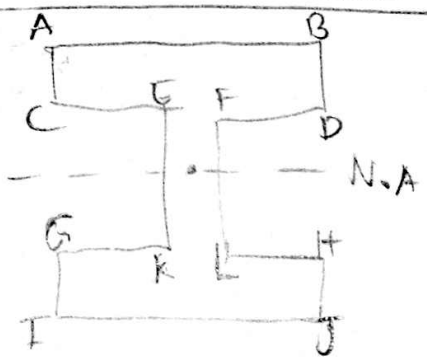
$y_c = \frac{216.5}{37} = 5.85\,cm$

centroid = (0, 5.85)

$$I_{TOTAL} = \left[\frac{10 \cdot 2^3}{12} + (3.15)^2 \cdot 20\right] + \left[\frac{1 \cdot 7^3}{12} + 7 \cdot (1.35)^2\right] + \left[\frac{10 \cdot 1^3}{12} + 10(5.35)^2\right]$$

$$= 205.12 + 41.34 + 287.06 = 533.52\,cm^4$$

$\tau = \frac{VQ}{Ib}$ V = 400kN, I = 533.52cm⁴, b = ?



For τ_{AB}... Q = 0, so $\tau_{AB} = 0$

For τ_{CD}... $Q = \Sigma A\bar{y} = (20)(3.15) = 63\,cm^3$, so $\tau_{CD} = \frac{400 \times 63}{533.52 \times 10} = 4.72\,kN/cm^2$

For τ_{EF}... $Q = \Sigma A\bar{y} = (20)(3.15) = 63\,cm^3$ so $\tau_{EF} = \frac{400 \times 63}{533.52 \times 1} = 47.23\,kN/cm^2$

For $\tau_{N.A}$... $Q = \Sigma A'\bar{y}' = (2.15)(1.075) + 20(3.15) = 65.31\,cm^3$

so $\tau_{N.A} = \frac{400 \times 65.31}{533.52 \times 1} = 48.97\,kN/cm^2$

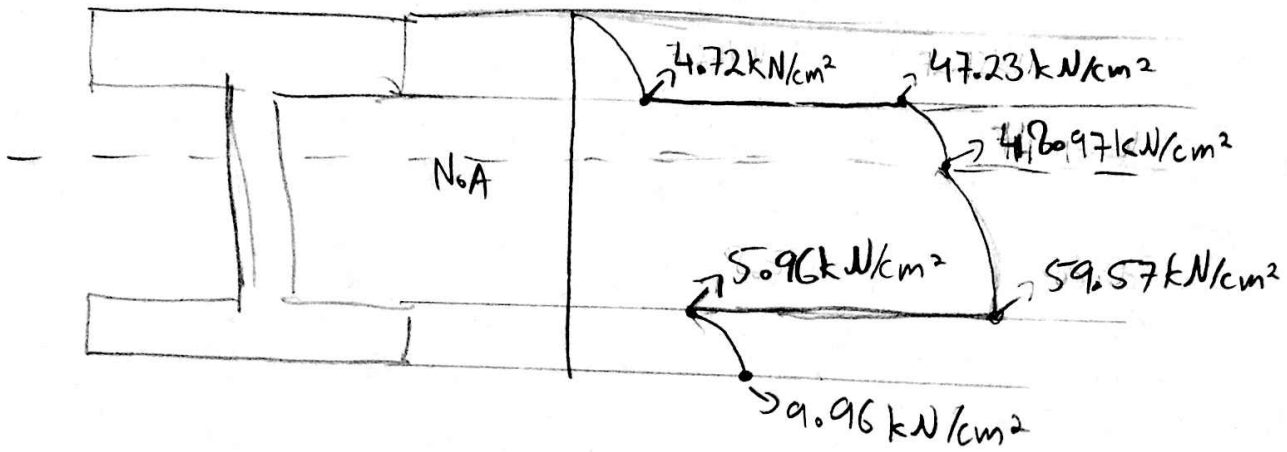
For τ_{GH}... $Q = \Sigma A'\bar{y}' = 7(2.35) + 20(3.15) = 79.45\,cm^3$

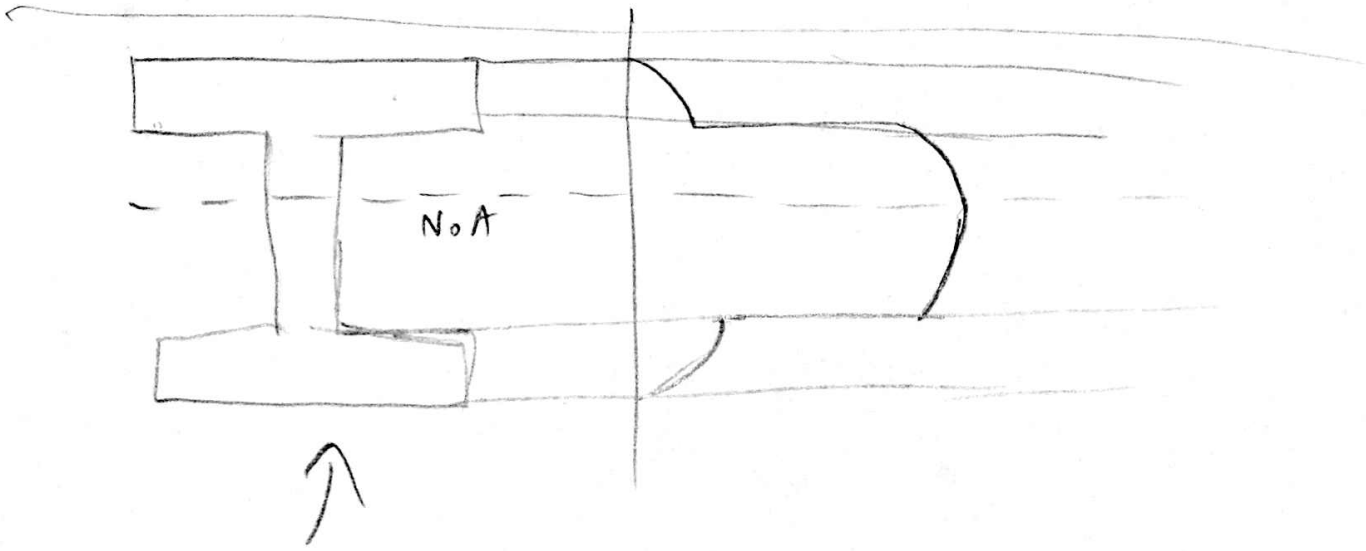
so $\tau_{GH} = \frac{400 \times 79.45}{533.52 \times 10} = 5.96\,kN/cm^2$

For τ_{KL}... $Q = 113.45\,cm^3$, $\tau_{KL} = \frac{400 \times 79.45}{533.52 \times 1} = 59.57\,kN/cm^2$

For τ_{IJ}... $Q = \Sigma A' \bar{y}' = 10(5.35) + 7(2.35) + 20(3.15) = 132.9 cm^3$

so $\tau_{IJ} = \frac{400 \times 132.9}{533.52 \times 10} = 9.96 kN/cm^2$





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why is it not like this?