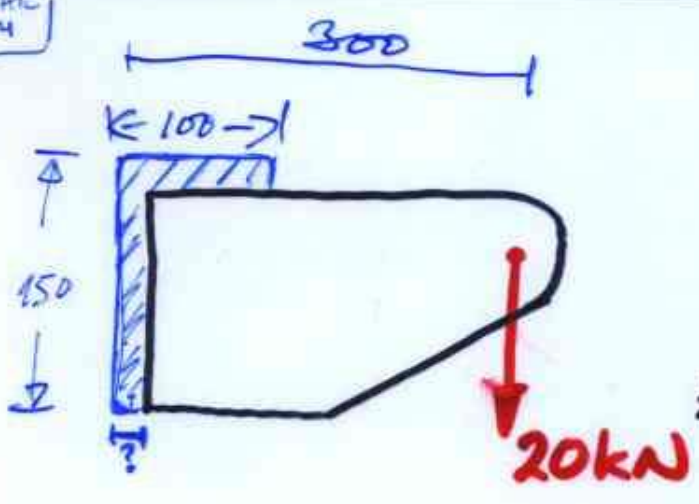


26-MAR-2024

PREVIOUS DAY

1



$$S_y = 345 \text{ MPa}$$

$$F.S. = 2.5$$

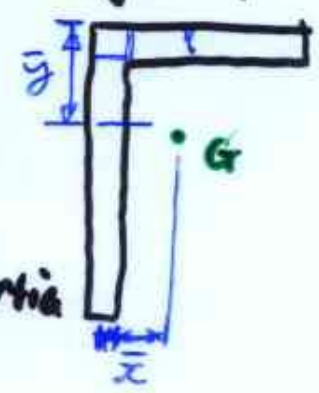
* specify weld *

SOLUTION SEQUENCE:

① find centroid of weld group

$$\bar{x} = \frac{\sum A_i x_i}{\sum A_i}$$

$$\bar{y} = \frac{\sum A_i y_i}{\sum A_i}$$



② find POLAR MOMENT of INERTIA about G: J

$$J = I_x + I_y \quad (I_x = \int y^2 dA)$$

③ EXPRESS LOAD AS A FORCE + TORQUE at G. i.e. 20 kN & $(20)(300 - \bar{x})$ Nm

④ CALCULATE STRESSES @ EXTREME PLS.

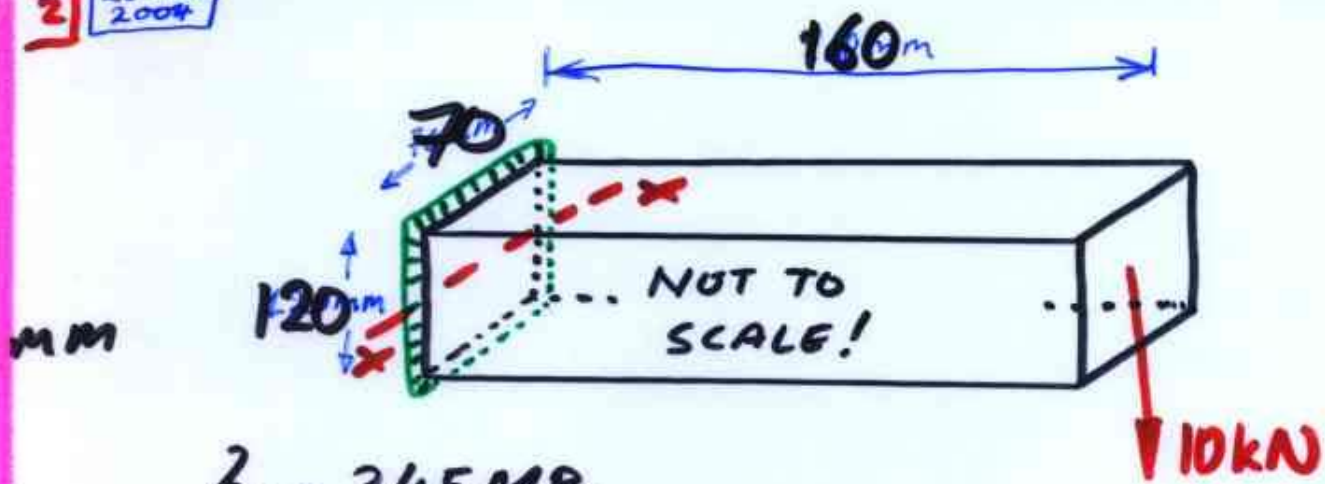
$$\tau = \frac{T r}{J} \quad \text{but: } \tau_x = \frac{T r_y}{J} \quad \tau_y = \frac{T r_x}{J} \quad \left. \begin{array}{l} \text{TORQUE} \\ \text{DIRECT} \end{array} \right\}$$

$$\tau = \frac{V}{A} \quad \dots \quad \text{HERE } \tau = \frac{20 \text{ kN}}{(250 \text{ mm})(t)}$$

⑤ FIND LARGEST RESULTANT SHEAR: $\frac{692}{t}$

FAIL CRITERION (SHEAR ... DIST. EN.)

$$\frac{692}{t} = \frac{(0.58)(S_y)}{(F.S.)} \quad \text{etc.,}$$



$$\sigma_y = 345 \text{ MPa}$$

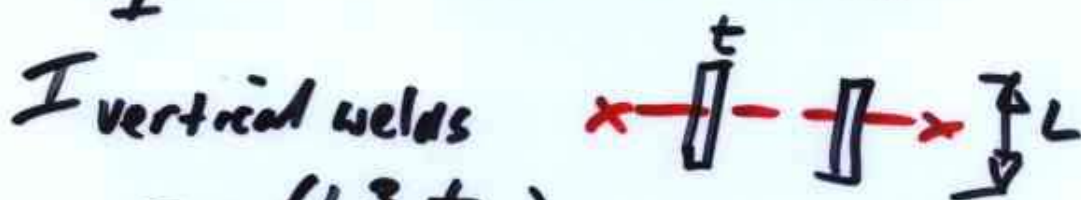
find required WELD dimension

① Bending moment

$$(10 \times 10^3) (16 \times 10^{-3}) = 16000 \text{ Nm}$$

② $\sigma = \frac{My}{I}$

NEED I_{xx}

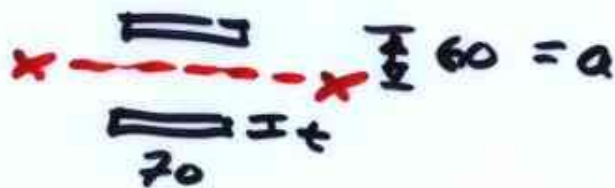


$$I = \left(\frac{L^3 t}{12} \right) (\times 2)$$

↑
2 welds

$$= 2 (144 \times 10^{-9} t) \text{ m}^4$$

$I_{\text{Hz welds}}$



$$= 2 L t a^2$$

$$= 2 (70)(t)(60)^2 = 2 (252 \times 10^{-9} t) \text{ m}^4$$

$$\text{TOTAL } I_{xx} = \frac{2 \times 252 + 2 \times 144}{792 \times 10^{-9} \text{ t m}^4}$$

$$\textcircled{3} \quad \delta = \frac{My}{I} = \frac{(1600)(60 \times 10^{-3})}{792 \times 10^{-9} \text{ t}}$$

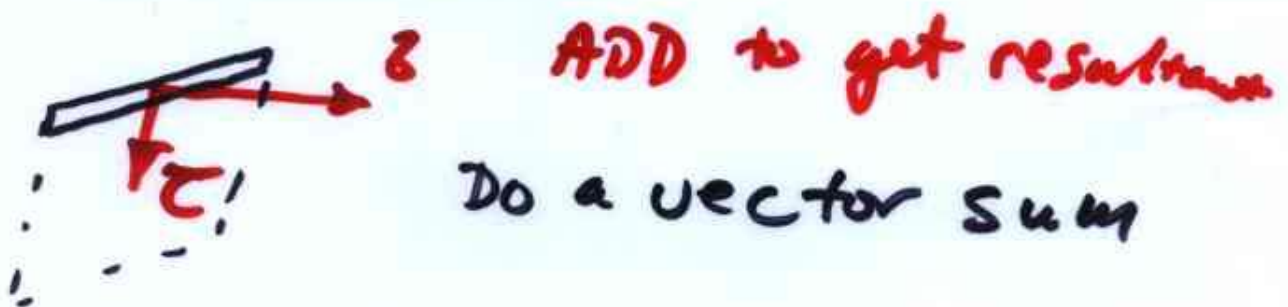
$$\delta = \frac{121.2}{\text{t}} \times 10^6 \text{ N/m}^2$$

DUE TO BENDING

$$\tau = \frac{V}{A} = \frac{10500}{(120 \times 2 + 70 \times 2) \text{ t}} = \frac{26.3 \times 10^6}{\text{t}} \text{ N/m}^2$$

total length

$\textcircled{4}$ Combine Stresses.



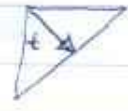
$$\frac{1}{\text{t}} \sqrt{(121.2)^2 + (26.3)^2}$$

$$= \frac{124}{\text{t}} \text{ MPa}$$



(B)

So we have $\frac{124}{t}$ MPa on weld throat, shear



$$\frac{(345)(0.58)}{(3)} = \frac{124}{t}$$

F.S.

$$t = 1.86 \text{ mm}$$

$$h = t / 0.707 = 2.63 \text{ mm}$$

∴ spec 3mm