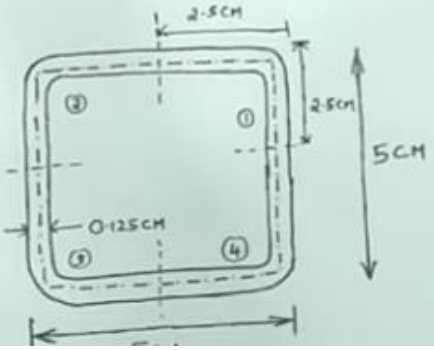
FIND THE CRIPPLING STRESS FOR SQUARE TUBE MADE OF 2024 T3 Al.
$F_{cy} = 288\ MPa$, $E = 75\ GPa$. ASSUME THE SECTION IS FORMED SECTION. AREA $= 2.30\ cm^2$



$$\frac{F_{cs}}{F_{cy}E} = Ce\left(\frac{b'}{t}\right)^{0.75} \quad -①$$

$$\frac{b'}{t} = \frac{a+b}{2t}$$

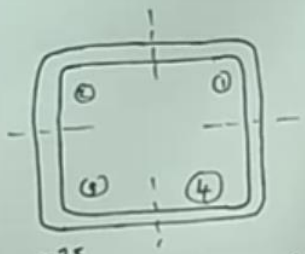
$$a = 2.5 - \frac{0.125}{2}$$

$$b = 2.5 - \frac{0.125}{2}$$

$$\frac{b'}{t} = \frac{\left(2.5 - \frac{0.125}{2}\right) * 2 \times 10^{-2}}{2 * 0.125 \times 10^{-2}} \quad -②$$

$$\frac{F_{cs}}{\sqrt{F_{cy}E}} = Ce\left(\frac{b'}{t}\right)^{0.75}$$

$$F_{cs} = \sqrt{F_{cy}E} * Ce\left(\frac{b'}{t}\right)^{0.75}$$



$$= \sqrt{288 \times 10^6 * 75 \times 10^9} * 0.366 \times \left(\frac{2.5 - \frac{0.125}{2}}{0.125}\right)^{0.75}$$

$Ce = 0.366$ (No edge free)
$= 0.342$ (One edge free)
$= 0.312$ (Two edge free)

$$= 0.366 * 9.27 * \sqrt{2.16 \times 10^{11}}$$

$$F_{cs} = 1.57 * 10^{10}\ N/m^2$$

$A = 2.3\ cm^2$

$A_1 = \frac{2.3}{4}\ cm^2$

Crippling load of section ①

$P_{cs①} = F_{cs} * \text{Area of Section}$

$= 1.57 \times 10^{10} * \frac{2.3}{4} * 10^{-4}$

$P_{cs①} = 914.525\ N$

$P_{cs} = 914.525 * 4\ N$

$F_{cs} = \frac{914.525 \times 4}{2.3 * 10^{-4}} = 157 * 10^6\ N/m^2$

$= 15.7\ GPa$

$$\frac{F_{cs}}{\sqrt{f_{cu}}} = C_e \left(\frac{b'}{t}\right)^{0.75} \quad -①$$

$$\frac{b'}{t} = \frac{a+b}{2t}$$

$$a = 2.5 - \frac{0.125}{2}$$

$$b = 2.5 - \frac{0.125}{2}$$

$$\frac{b'}{t} = \frac{\left(2.5 - \frac{0.125}{2}\right) * 2 \times 10^{-2}}{2 * 0.125 \times 10^{-2}} \quad -②$$