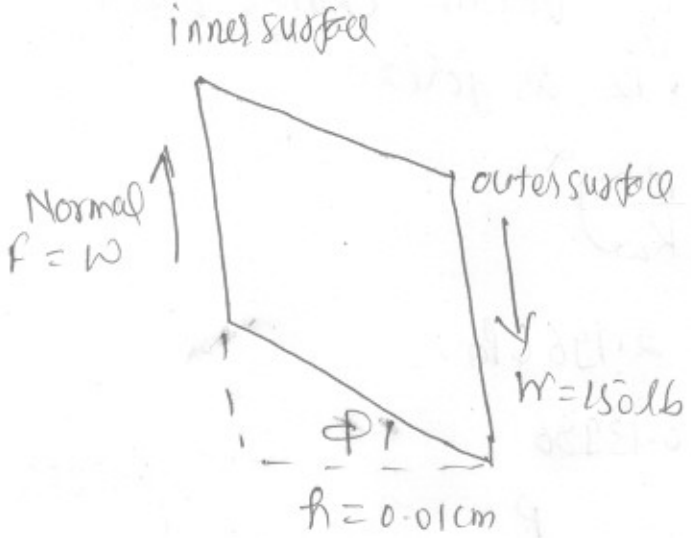
SOLUTION



(a) Area of cross-section $= 4.0 \times 10^{-4} cm^2$

Shear force by bend $= 1N$

thrust by person of can $= 150lb$

$= 150 \times 4.448N$

Young's Modulus of elasticity, $Y = \frac{150 \times 4.448 \times 0.01 \times 10^{-2}}{4 \times 10^{-8} \times 4 \times 10^{-6}}$

$\Rightarrow Y = 0.417 \times 10^{12}$

Shear Modulus, $G = \frac{Y}{2+2\nu}$

where, ν = Poisson's Ratio

$= 0.33$ for Aluminium

$\Rightarrow G = \frac{0.417 \times 10^{12}}{2.66} = 1.57 \times 10^{11}$

Now, $G = \frac{\text{Shear Stress}}{\text{Shear Strain}}$

$\Rightarrow 1.57 \times 10^{11} = \frac{1.0}{4 \times 10^{-8} \times \Phi}$

$\Rightarrow \Phi = \frac{1.0}{6.8 \times 10^{3}}$ radian $= 1.47 \times 10^{-4}$ radian

(b) Also, $\phi = \frac{x}{h}$

$\Rightarrow 1.47 \times 10^{-4} = \frac{x}{0.01 \times 10^{-2}}$

$\Rightarrow x = 1.47 \times 10^{-8}\ m$

$= 1.47 \times 10^{-6}\ cm$

Answers:

(a) max shear angle (phi) $= 1.47 \times 10^{-4}$ radian

(b) relative displacement of inner and outer surface of can $= 1.47 \times 10^{-6}\ cm$