

TOPIC

Strength of Materials – Section VIII – Question 1

QUESTION

A 1-meter diameter steel cylindrical tank used to store propane at high pressure. If the allowable stress of steel is 100 MPa and the propane is stored at a pressure of 1000 kPa, the minimum thickness in mm of the tank most nearly is

- (A) 5.0
- (B) 7.5
- (C) 10
- (D) 20

HINT

Hoop stress in the tank governs the maximum allowable stress
Hoop stress is equal to circumferential stress and tangential stress

SOLUTION

$$\begin{aligned}\sigma_{Maxallowable} &= \sigma_{hoop} = \sigma_{circumferential} = \sigma_{tangential} = \frac{Pr}{t} \\ t &= \frac{Pr}{\sigma_{Maxallowable}} \\ &= \frac{1000 \times 10^3 (0.5)}{100 \times 10^6} \\ &= 0.005m \\ &= 5mm\end{aligned}$$

ANSWER

(A)

CONTRIBUTOR

Glen Besterfield