A non-deformable pressure vessel of $V_1 = 0{,}10m^3$ volume filled completely with methyl alcohol was heated from temperature $T_1 = 273K$ to temperature $T_2 = 323K$. Calculate the pressure increase in the vessel. For the calculation assume $\beta = 0{,}122 \cdot 10^{-8}\frac{m^2}{N}$, $\alpha = 1{,}19 \cdot 10^{-3}\frac{1}{K}$.

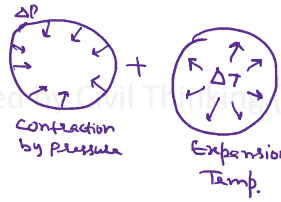
Two formulas to use:

Compression by pressure

$$\beta = \frac{-\Delta V/V}{\Delta P}$$

Expansion by temp.

$$\alpha = \frac{-\Delta V/V}{\Delta T}$$



$= 0$ [Non-Deformable]

$\Rightarrow \Delta V_P + \Delta V_T = 0$

$\Delta V_{Temp} + \Delta V_{Pr} = 0$ [Non deformable]

$\alpha V \Delta T + (-\beta V \Delta P) = 0$

$\Rightarrow \alpha \Delta T = \beta \Delta P$

$$\Rightarrow \boxed{\Delta P = \frac{\alpha \Delta T}{\beta}} = 4.88 \times 10^7 Pa$$

ANS.

[$\Delta T = 323K - 273K = 50K$]

$$\frac{1.19 \times 10^{-3} \times 50}{0.122 \times 10^{-8}} = 48770491.8$$

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