Pressure Theory

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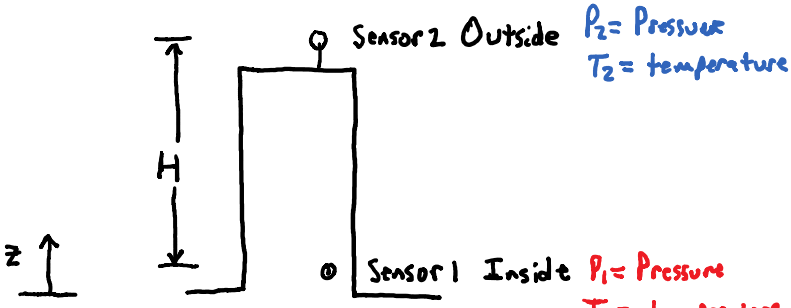

Physics Building

H = Vertical Distance Between sensors

The sensors are separated by 4 floors.

We want to test the sensors to see if the calculated H is reasonable.

Note: We expect $P_2 < P_1$ Since the sensor P_2 is at the higher heigth and pressure drops off as z increases.

Theory:

Use the hydrostatic equation to relate pressure and height.

$dP = -\rho g dz$ or in difference form

$P_1 - P_2 = \rho g H$. So

(1) $$H = \frac{P_1 - P_2}{\rho g}$$

Here $\rho = \frac{P}{R_d T}$ is air density

R_d = gas constant for air

$R_d = 287.7 \frac{J}{Kg\,K}$

We can use

$\rho = \frac{\rho_1 + \rho_2}{2}$ = average density in $\frac{Kg}{m^3}$

Where

$\rho_1 = \frac{P_1}{R_d T_1}$ $\rho_2 = \frac{P_2}{R_d T_2}$

Note that T_1 and T_2 need to be in Kelvin units.