

9-11

- FIND F/A :

$$A = \pi r_{\text{WIRE}}^2 \quad r_{\text{WIRE}} = 0.20 \text{ cm} = 2 \times 10^{-3} \text{ m}$$

$$A = \pi (2 \times 10^{-3} \text{ m})^2 = 1.26 \times 10^{-5} \text{ m}^2$$

$$F/A = \frac{5.8 \times 10^3 \text{ N}}{1.26 \times 10^{-5} \text{ m}^2} = 4.62 \times 10^8 \text{ Pa}$$

- TREAT ALUMINUM & COPPER SEPARATELY

$$\text{ALUMINUM: } Y_{\text{AL}} = 7.0 \times 10^{10} \text{ Pa}$$

$$\frac{F}{A} = Y_{\text{AL}} \frac{\Delta L_{\text{AL}}}{L_{0,\text{AL}}} \Rightarrow \Delta L_{\text{AL}} = \frac{F}{A} \frac{L_{0,\text{AL}}}{Y_{\text{AL}}}$$

$$\Rightarrow \Delta L_{\text{AL}} = (4.62 \times 10^8 \text{ Pa}) \frac{1.3 \text{ m}}{7.0 \times 10^{10} \text{ Pa}} = 0.0086 \text{ m}$$

$$\text{COPPER: } \Delta L_{\text{CU}} = \frac{F}{A} \frac{L_{0,\text{CU}}}{Y_{\text{CU}}} = (4.62 \times 10^8 \text{ Pa}) \frac{2.6 \text{ m}}{11 \times 10^{10} \text{ Pa}}$$

$$\Rightarrow \Delta L_{\text{CU}} = 0.0109 \text{ m}$$

$$\Delta L_{\text{TOTAL}} = \Delta L_{\text{AL}} + \Delta L_{\text{CU}} = 0.0086 \text{ m} + 0.0109 \text{ m}$$

$$= \boxed{0.0195 \text{ m}} = \boxed{19.5 \text{ mm}}$$

VARIATION OF PRESSURE WITH DEPTH

CONSIDER FORCES ACTING ON VOLUME OF WATER

TOP: $F_1 = P_1 A$ PUSHING DOWN

BOTTOM: $F_2 = P_2 A$ " UP

GRAVITY: ON THE MASS OF FLUID IN THE VOLUME PULLING DOWN

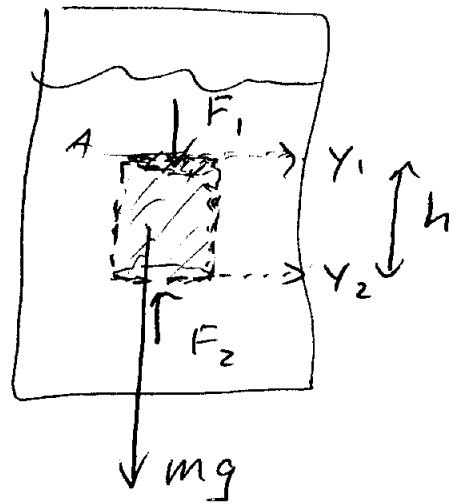
FLUID IS IN EQUILIBRIUM, SO

$$P_2 A - P_1 A - mg = 0$$

$$\text{BUT } m = \rho V \\ = \rho Ah$$

$$\Rightarrow (P_2 - P_1) A - \rho Ahg = 0$$

$$P_2 = P_1 + \rho gh$$



WHERE m IS THE MASS OF FLUID IN THE VOLUME