#3.62

Purpose: calculate the pressure at Point A [kPa (gage)]

Drawing:

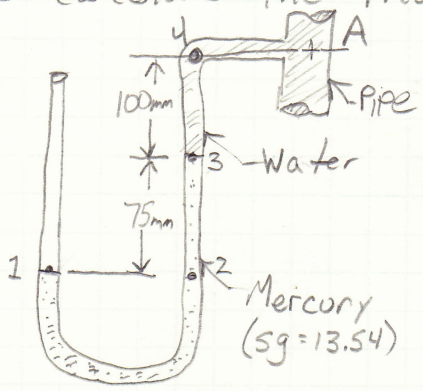


Fig 3.26

Sources: Mott R. and Untener J. Applied Fluid Mech 7th ed. Pearson 2014

Data: Sg (Mercury) = 13.54

Solution: $\Delta P_A = \gamma * h$

$P_2 = P_1 \Rightarrow P_2 = P_2 - \gamma_m (0.75m)$

$P_4 \quad P_2 - \gamma_m (0.075m) - \gamma_w (0.1m)$

$P_1 = P_a + m = \emptyset Pa$ (gage)

$\gamma_m = (Sg)_m (9.81 kN/m^3) = (13.54)(9.81)$

$= 132.8 kN/m^3$

$\gamma_w = 9.81 kN/m^3$

$P_4 = \emptyset Pa - (132.8 kN/m^3)(0.075m) - (9.81 kN/m^3)(0.1m)$

$P_A = P_4 = -9.96 kN/m^2 - 0.981 kN/m^2 = -10.94 kN/m^2 = \boxed{-10.94 kPa (gage)}$

Problem #3.90

Express $P = -68.2 kPa$ in mm Hg

From textbook: $1 Pa = 0.0075 mm Hg$

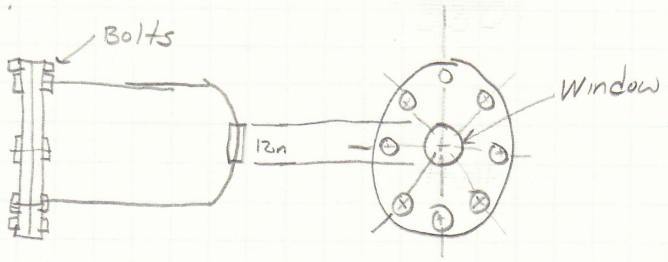
$P = -68.2 kPa \cdot \frac{1000 Pa}{kPa} = -68,200 Pa$

$P = -68,200 Pa \cdot \frac{0.0075 mm Hg}{1 Pa} = \boxed{-511.5 mm Hg}$

Problem 4.2

Purpose: Find total force that must be resisted by the Bolts in the flange

Drawing:



Given: Inside diameter is 30 inches, internal pressure is raised to +14.4 psig

$D = 30$ inches
$P = 14.4$ psig

Solution: by rearranging the equation for pressure $P = \frac{F}{A}$ we can calculate the Force acting on the bolted plate

$$P = \frac{F}{A} \Rightarrow F = pA$$

$P = 14.4$ psig
$A =$ Area of 30" diameter flange
$= \frac{\pi D^2}{4} = \frac{\pi 30^2}{4} = 706.86\ in^2$

Substitute values for pressure and area

$$F = (14.4[psig])(706.86[in^2]) = 10,178.78 \text{ pounds}$$