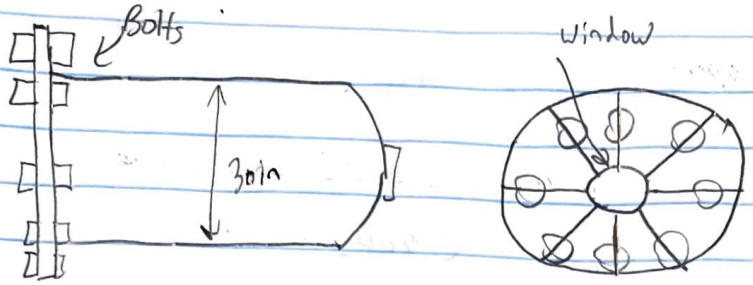
Homework HW 2.1 2, 10, 17, 28

4.2)



Internal Pressure: +14.4 psig

Calculate the total force that must be resisted by the bolts in the flange

$$F = PA$$

$$A = \frac{\pi D^2}{4} = \frac{\pi (30)^2}{4} = 706 in^2$$

$$F = (14.4 psig)(706 in^2)$$

$$= 10166.4 lbf$$

Cylindrical tank

4.10) D = 500 mm h = 1.800 m

shower
D = 75 mm opening

Find how much force is required to open the valve.

$A = \frac{\pi (75mm)^2}{4} = 4417.86\ mm^2$

$= 4.418 \times 10^{-3}\ m^2$

$F = PA$

$h = P_a/\gamma$

$P_a = (h)(\gamma) = 9.81\ \frac{kN}{m^3} \cdot 1.800 m = 17.658\ \frac{kN}{m^2}$

$F = (4.418 \times 10^{-3}\ m^2)(17.658\ kN)$

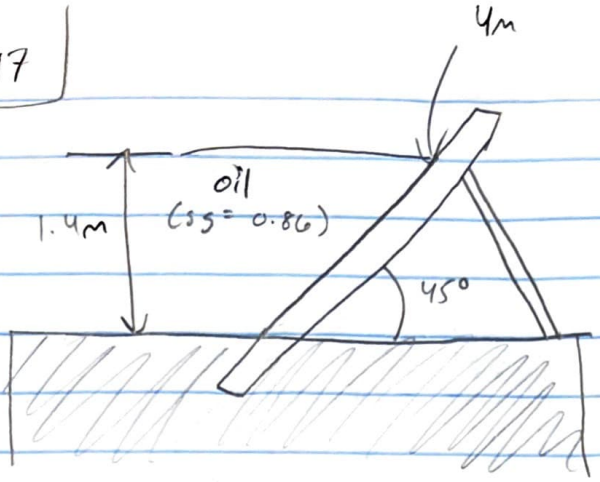
$= 0.0780\ kN$

$\Sigma M_O = 0$

$(0.0780 kN)(37.5)$

$= 0.0450 kN$

4.17



$SG = 0.86$

$= 860 \frac{kg}{m^3}$

$\gamma = (860)(9.81) = 8436.6$

Calc the total force on the wall due to oil pressure.

Determine the location of the center of pressure and show the resultant force on the wall.

$\sin\theta = \frac{1.4}{\sin 45} = 1.980m$

$A = 1.980m(4m) = \boxed{7.920m^2}$

$F = \gamma h_c A$ $F = 8436.6 \cdot \frac{1.4}{2} \cdot 7.920m^2$

$= \boxed{46.77 kN}$

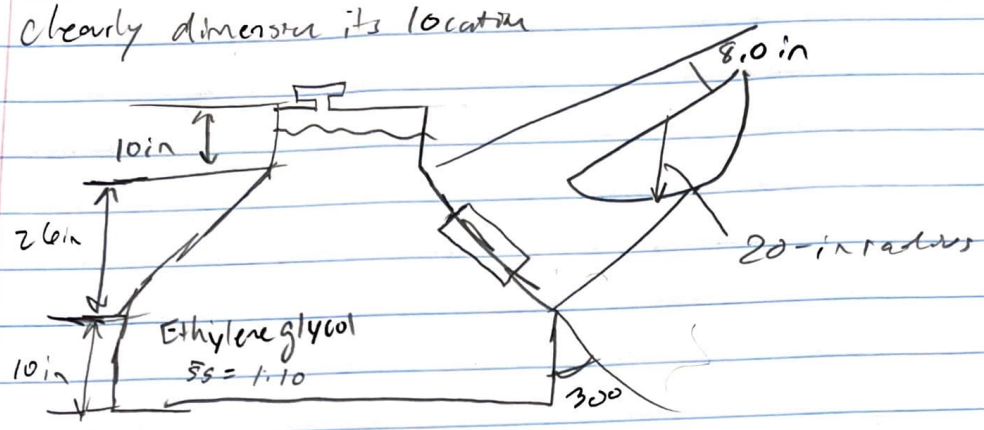
$L_p = L - \frac{L}{3}$

$1.980 - 0.659 = 1.32m$

$h_p = h - \frac{h}{3} = \frac{2(1.4)}{3} = \boxed{9.33m}$

4.28

- Compute the magnitude of the resultant force and location of the center of pressure. Show resultant force on the area and clearly dimension its location



MOI

$$I_{cm} = I_r - Ad^2$$

$$\frac{\pi (20\text{in})^4}{8} - \frac{8(20)^4}{9\pi}$$

$$= 17,561 \left(0.0254_m^4\right)$$

$$= 7.309 \times 10^{-3} m^4$$

Centroid Distance:

$$h_c = 10 + (8.48 + 8)\cos 30$$

$$= 24.272 (0.0254m)$$

$$= 0.617_m$$

$$F = (1,100)(0.405)(9.81)(0.617)$$

$$F_{resultant} = 2.696\ kN$$

A semi-circular

Semicircular arc

$$A = \frac{\pi (20)^2}{2}$$

$$= 628.32 in^2 (0.0254)$$

$$= 0.405 m^2$$