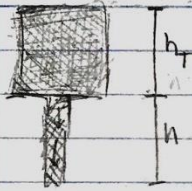




$$P = \rho g h \quad P = 1000 \text{ kg/m}^3 \cdot 9.81 \text{ m/s}^2 \cdot h$$

This P would be the empty tank's pressure. We need a max of 160 kPa at the outlet whether the tank is full or not.



$$P = \rho g h + \rho g h_T \rightarrow P = \rho g (h + h_T)$$

$$\begin{aligned} P/\rho g &= h + h_T \\ P/\rho g - h_T &= h \end{aligned}$$

Assuming 10 meter tank:

$$P = 160,000 \text{ Pa} \quad \rho_w = 1000 \text{ kg/m}^3 \quad h_T = 10 \text{ m}$$

$$\begin{aligned} h &= \frac{160,000}{9810} - 10 \\ &= 6.31 \text{ m} \end{aligned}$$

$h_T = 25 \text{ m}$:



$$P = 160,000 \text{ Pa} ; \rho_w = 1000 \text{ kg/m}^3 ; h_T = 25 \text{ m}$$

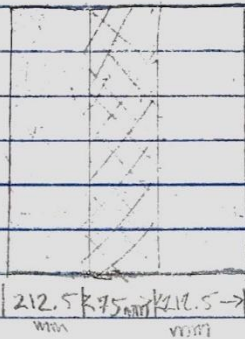
$$h = \frac{160,000}{9810} - 25 = -8.69 \text{ m}$$

Above 16.31 meters in height the tank needs to be lower than the ground to have an outlet at 160 kPa.

Etanah

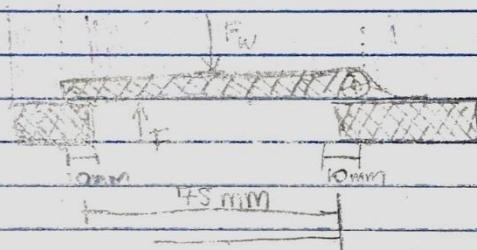
4.10

 water on valve
 water



Tank

1800 mm



Valve

Considerations

- Fluid is water
- Incompressible
- Isothermal

Procedure

1. I will calculate the Forces to sum them.
2. I will calculate the moments to sum them.
3. The Force required to open it is any force larger than the force holding it, so this is what I will solve for.