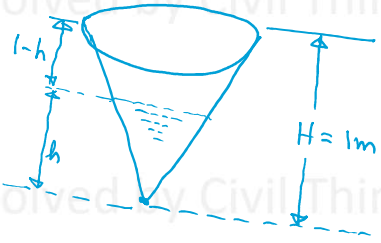
Hydrostatic Cone Problem Solution:

Water was poured into a vessel in the shape of an inverted cone with a height H = 1m up to half of its capacity. Calculate the hydrostatic pressure at the lowest point inside the vessel.

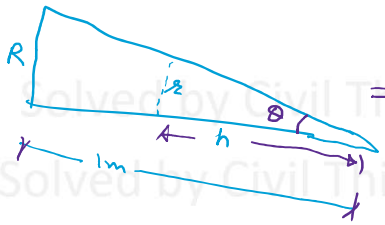
Solution:



$$V_w = \frac{1}{2} V_c$$

$$\Rightarrow \pi r^2 \times \frac{h}{3} = \frac{1}{2}\left(\pi R^2 \times \frac{H}{3}\right), \quad H = 1\,m$$

$$\Rightarrow r^2 h = R^2/2 \Rightarrow h = \frac{R^2}{2r^2} \quad -(1)$$



$$\Rightarrow \tan\theta = \frac{r}{h} = \frac{R}{1} \Rightarrow r = Rh$$

Put $r = Rh$ in (1)

$$\Rightarrow h = \frac{R^2}{2R^2h^2} \Rightarrow h^3 = \frac{1}{2}$$

$$\Rightarrow h = \left(\frac{1}{2}\right)^{1/3} = 0.794\,m$$

$$P = \rho g h = 1000\,kg/m^3 \times 9.81\,m/s^2 \times 0.794\,m \simeq 7789\,N/m^2$$

Ans.

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