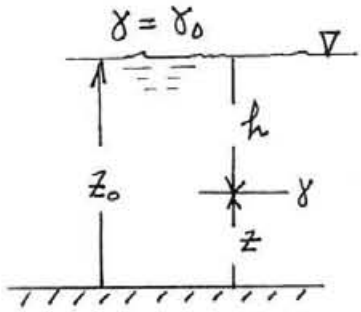
2.9 Develop an expression for the pressure variation in a liquid in which the specific weight increases with depth, h, as $\gamma = Kh + \gamma_0$, where K is a constant and γ_0 is the specific weight at the free surface.



$$\frac{dp}{dz} = -\gamma \qquad \text{(Eq. 2.4)}$$

Let $h = z_0 - z$

so that $dh = -dz$

Thus,

$$dp = \gamma\, dh$$

and

$$\int_0^p dp = \int_0^h \gamma\, dh$$

For $\gamma = Kh + \gamma_0$,

$$\int_0^p dp = \int_0^h (Kh + \gamma_0)\, dh$$

and

$$\underline{\underline{p = \frac{Kh^2}{2} + \gamma_0 h}}$$