

EQUATIONS FOR BASIC HYDRAULIC PRINCIPLES

Lesson 1: Fluid Properties

Force = Mass (M) times acceleration (a) (Newton's Law)

or

Weight (pounds) = mass (slugs) times gravity (g in ft/sec^2),

where acceleration, $g = 32.2 \text{ ft}/\text{sec}^2$

Density (ρ) = Mass of fluid/unit volume, where $\rho_{\text{water}} = 1.94 \text{ slugs}/\text{ft}^3$

Unit weight (γ) = weight of fluid/unit volume = ρg

where $\gamma_{\text{water}} = 62.4 \text{ pounds}/\text{ft}^3$

Dynamic viscosity of fluid (μ , in $\frac{\text{sec lb}}{\text{ft}^2}$ or $\frac{\text{slug}}{\text{sec ft}}$) is defined by $\tau = \mu \frac{\partial v}{\partial y}$, where τ is the shearing stress in lbs/ft^2 , and the right-hand term is the rate of change of velocity in the fluid.

Kinematic viscosity (ν , in ft^2/sec) = μ/ρ

Pressure (P) = unit weight of water (γ_{water}) times depth (y),

which says pressure increases linearly with depth.

Lesson 2: Forces on Submerged Objects

Force on a vertical rectangular gate:

$$F = \frac{\gamma W D^2}{2}, \text{ where } D = \text{depth, } W = \text{width (triangular pressure prism)}$$

Force is always equal to volume of pressure prism, and acts through the centroid of the pressure prism. Force is also equal to the pressure at the centroid of the gate area times the area of the gate.

To calculate centroid of a complex shape:

$$F_R \cdot y_R = \Sigma(F \cdot y) \text{ or } y_R = \frac{\Sigma(F \cdot y)}{F_R}, \text{ where } F_R \text{ is the resultant force}$$

Lesson 3: Similitude and Dimensional Analysis

Reynolds Number, $Re = V\rho/\mu$ (Velocity, length, density/viscosity)

Froude Number, $Fr = \frac{V}{\sqrt{gD}}$ where V = velocity, D = depth, g = gravity, $32.2 \text{ ft}/\text{sec}^2$

Equations For Basic Hydraulic Principles

RJ Shavelson



Equations For Basic Hydraulic Principles:

Reviewing **Equations For Basic Hydraulic Principles**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is truly astonishing. Within the pages of "**Equations For Basic Hydraulic Principles**," an enthralling opus penned by a very acclaimed wordsmith, readers embark on an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve to the book is central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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