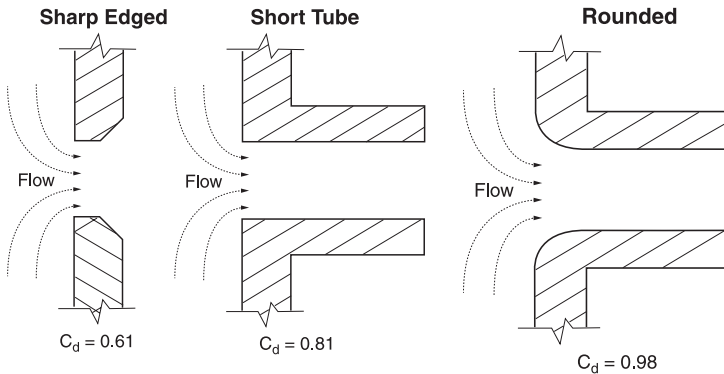


Formulas for Calculating Flow Rate From a Vessel

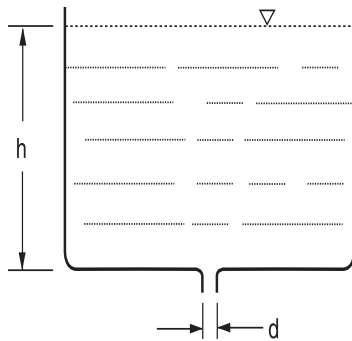
The following formulas are for calculating the rate at which a fluid will flow from a tank when the fluid level is maintained constant (h is constant). The discharge coefficient C_d depends on the configuration of the outlet. Some typical values for discharge coefficient are shown below.



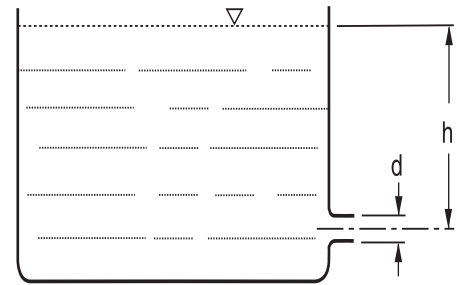
Variables:

- h = Elevation of tank
- d = Diameter of tank
- a = Orifice area (ft²)
- g = Gravitational acceleration = 32.2 ft/sec²
- q = Volume flow rate of fluid through opening (in³/sec)
- C_d = Discharge coefficient

Bottom Opening
 $q = C_d(a) \sqrt{2gh}$



Side Opening
 $q = C_d(a) \sqrt{2gh}$



EXAMPLES

EXAMPLE ONE

An open tank is continuously fed with water such that the height from the water surface to the outlet is maintained at 60". The outlet has a 1" diameter bulkhead fitting (comparable to a short tube outlet). The outlet area is calculated by:

$$a = \frac{\pi d^2}{4} = \frac{\pi (1^2)}{4} = 0.7854 \text{ in}^2$$

The flow of water through the outlet is given by:

$$q = 0.81 (0.7854) \sqrt{2 (386) 60} = 137 \text{ in}^3/\text{sec}$$

This flow rate is equivalent to about 36 gpm.