Flow Through Orifices.

Orifice Discharge into Free Air

An orifice is an opening with a closed perimeter through which water flows. Orifices may have any shape, although they are usually round, square, or rectangular.

Discharge through a sharp-edged orifice may be calculated from:

Q = Ca?2gh

where

Q= discharge, ft^3/s (m^3/s)

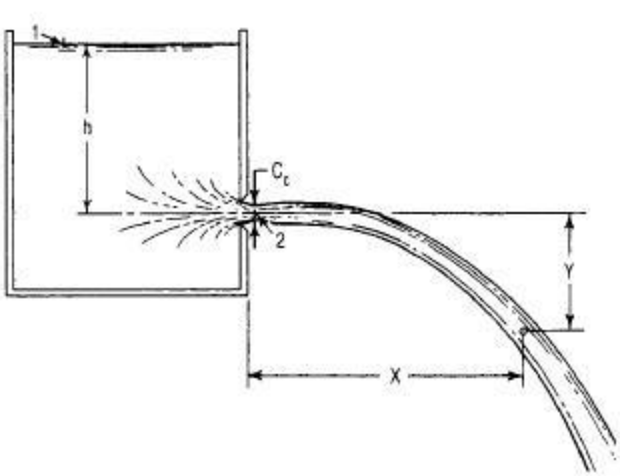
C =coefficient of discharge

a =area of orifice, ft^2 (m^2)

g =acceleration due to gravity, ft/s^2 (m/s^2)

h =head on horizontal center line of orifice, ft (m)

The coefficient of discharge C is the product of the coef- ficient of velocity C_v and the coefficient of contraction C_c. The coefficient of velocity is the ratio obtained by dividing the actual velocity at the vena contracta (contraction of the jet discharged) by the theoretical velocity. The theoretical velocity may be calculated by writing Bernoulli's equation for points 1 and 2.Thus



V_2= ?2gh

The coefficient of contraction C_c is the ratio of the smallest area of the jet, the vena contracta, to the area of the orifice.

Submerged Orifices

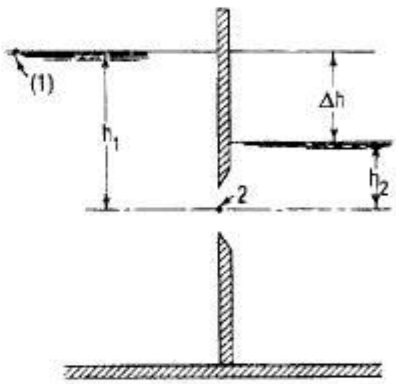
Flow through a submerged orifice may be computed by applying Bernoulli's equation to points 1 and 2 in figure below

$$V_2 = \sqrt{2g\left(h_1 - h_2 + \frac{V_1^2}{2g} - h_L\right)}$$

where h_L = losses in head, ft (m), between 1 and 2.

By assuming $V_1 \approx 0$, setting $h_1 - h_2 = \Delta h$, and using a coefficient of discharge C to account for losses, the following formula is obtained:

$$Q = Ca\sqrt{2g\,\Delta h}$$



Values of C for submerged orifices do not differ greatly from those for non submerged orifices.

Source: http://www.engineeringcivil.com/flow-through-orifices.html