

# Formulas and Cv Factors

## General Information about valve sizing:

Valves with a "Full Port" have an internal seat diameter that is the same as the nominal pipe size, i.e. a 1 inch pipe size valve with a full port has a 1 inch diameter seat. Valves with a "Reduced Port" have an internal seat diameter that is smaller than the nominal pipe size.

The valve's flow coefficient, Cv, is a value that is determined by flow testing for each valve size. Full port valves will have a higher Cv than reduced port valves. The Cv rating for each valve is listed in the tables found in the valve catalog.

The definition of Cv is the # of gallons of water that will flow through the valve with a 1 PSI pressure differential when the valve is open.

The equations below can be used to determine:

- Flow Rate, given the Cv and  $\Delta P$
- Cv, given the Flow Rate and  $\Delta P$
- $\Delta P$ , given the Flow Rate and Cv

Cv = Valve's flow coefficient (dimensionless value)

S = Specific Gravity (1.0 for air or water)

T = Absolute Temperature in °R (°R = °F + 460)

P<sub>1</sub> = Inlet Pressure in PSIG

$\Delta P$  = Pressure Differential in PSI across valve in the open position

V = Specific Volume in Cubic Feet per Pound

### For Liquids:

$$\text{A} \quad \text{GPM} = \text{Cv} \sqrt{\frac{\Delta P}{S}}$$

$$\text{B} \quad \text{Cv} = \text{GPM} \sqrt{\frac{S}{\Delta P}}$$

$$\text{C} \quad \Delta P = \left( \frac{\text{GPM}}{\text{Cv}} \right)^2 (S)$$

### For Air and Gasses:

$$\text{A} \quad \text{SCFH} = 1360 \text{ Cv} \sqrt{\frac{(P_1 + 15) \Delta P}{T S}}$$

$$\text{B} \quad \text{Cv} = \frac{\text{SCFH}}{1360} \sqrt{\frac{T S}{(P_1 + 15) \Delta P}}$$

$$\text{C} \quad \Delta P = \left( \frac{T S}{P_1 + 15} \right) \left( \frac{\text{SCFH}}{1360 \text{ Cv}} \right)^2$$

### For Steam:

$$\text{A} \quad \text{LB/HR.} = 63 \text{ Cv} \sqrt{\frac{\Delta P}{V}}$$

$$\text{B} \quad \text{Cv} = \frac{\text{LB/HR.}}{63} \sqrt{\frac{V}{\Delta P}}$$

$$\text{C} \quad \Delta P = (V) \left( \frac{\text{LB/HR.}}{63 \text{ Cv}} \right)^2$$

## Cv Factors:

The Cv factor is the number of U.S. gallons per minute that will pass through a valve with a pressure drop of (1) psi.

<b>Port Size in Inches</b>	3/32"	1/8"	5/32"	3/16"	1/4"	5/16"	3/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"
<b>Cv Factor</b>	0.2	0.3	0.36	0.53	0.7	1.7	2.0	3.5	7.5	13.0	17.0	25.0	48.0	60.0	100.0