TECHNICAL DATA

Valve Sizing - Check-All® furnishes two methods to aid the customer in the selection of the correct valve size to meet their flow requirements; **Flow Curves and C_V Factor**. Sizing accuracy requires the valve be fully open, which occurs when the pressure drop across the valve reaches or exceeds three times the spring cracking pressure (five times for 3S valves).

Flow Curves show the relationship between the rate of flow (water, gpm) and the pressure drop across the valve produced by that flow.

C_V Factor is a valve flow coefficient which mathematically gives the relationship between the rate of flow and the pressure drop.

> **Definition: C_V** is defined as the quantity of 60° F water, in gallons per minute, which will pass through a specific valve at maximum lift, at one (1) psi pressure drop.

It is experimentally determined by dividing the water flow through the valve by the square root of the pressure drop produced by that flow. Conversely, given the **C_V**, the water flow through the valve at any given pressure drop may be calculated by multiplying the **C_V** by the square root of the pressure drop. Therefore, for a given pressure drop, the higher the **C_V**, the higher the rate of flow.

For liquids other than water, for gases and for saturated steam, the formulae given below will show the relationship between the **C_V** (as obtained from water flow tests) and the flow of these fluids.

FLOW FORMULAE

(Non-Choked Turbulent Flow Only)

I. LIQUIDS

$$V = C_v\sqrt{\frac{dP}{G}} \qquad dP = \left(\frac{V}{C_v}\right)^2 G \qquad C_v = \frac{V}{\sqrt{\frac{dP}{G}}}$$

Where: V = Liquid flow (gpm)
dP = Pressure drop (psi)
G = Specific Gravity of liquid (water = 1.0)
C_V = Valve coefficient

II. GASSES

$$Q = 1360\,C_v\sqrt{\frac{dP}{GT}}\sqrt{\frac{P_1+P_2}{2}} \qquad dP = P_1 - \sqrt{P_1^2 - 2GT\left(\frac{Q}{1360\,C_v}\right)^2} \qquad C_v = \frac{Q}{1360\sqrt{\frac{dP}{GT}}\sqrt{\frac{P_1+P_2}{2}}}$$

Where: Q = Gas flow (scfh)
dP = Pressure drop (psi)[1]
T = Absolute temperature of flowing medium (degrees Rankine = °F + 460)
P_1 = Inlet pressure (psia)
P_2 = Outlet pressure (psia)
C_V = Valve coefficient
G = Specific Gravity of gas (air = 1.0)

III. SATURATED STEAM

$$W = 3\,C_v\sqrt{dP}\sqrt{\frac{P_1+P_2}{2}} \qquad dP = P_1 - \sqrt{P_1^2 - 2\left(\frac{W}{3\,C_v}\right)^2} \qquad C_v = \frac{W}{3\sqrt{dP}\sqrt{\frac{P_1+P_2}{2}}}$$

Where: W = Saturated steam flow (lbs. per hour)
dP = Pressure drop (psi)[1]
P_1 = Inlet pressure (psia)
P_2 = Outlet pressure (psia)
C_V = Valve coefficient

1 - For calculation purposes, dP should never exceed 1/2 the inlet pressure, P_1.