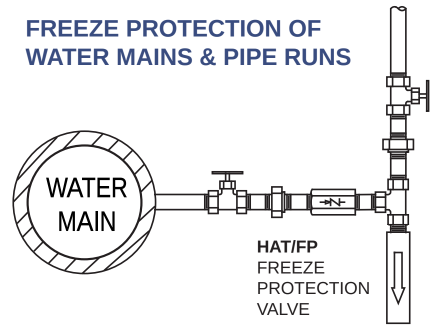
ThermOmegaTech®

APPLICATION #3

APPROXIMATE Cv REQUIRED FOR FREEZE PROTECTION OF UNINSULATED WATER LINES

ISO9001 CERTIFIED

In a "Resupply System", a pressurized source replaces water. Freeze protection is provided by removing the colder water from the system, and allowing warmer resupply water to modulate the valve closed. Larger valves will not waste water, and it is impossible to oversize. The rate at which water must be removed can be calculated as follows:

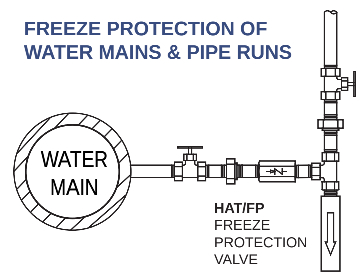


1) $$GPM = \frac{A_1 A_2 (0.5t_w - t_a + 16)}{40.1\, d^2 (t_w - 32)}$$

Where:

GPM	=	Gallons per minute of water flow
A_1	=	Pipe flow area, ft²
A_2	=	Exposed pipe surface area, ft²
t_w	=	Temperature of resupply water, °F
t_a	=	Minimum air temperature, °F
d	=	ID of pipe, ft

The valve flow coefficient (C_V) required to remove water at this rate is calculated as follows:



2) $$CV = \frac{GPM}{\sqrt{\Delta P}}$$

Where:

GPM	=	Gallons per minute of water flow
C_V	=	Total required C_V of valves
ΔP	=	Pressure drop across valves (PSIG) (If valves discharge to atmosphere, $\Delta P = P_S$ where P_S is supply pressure.)

Example: Freeze protect a 125 foot long run of uninsulated 2" pipe when the minimum air temperature is -15°F. The resupply water is 40°F minimum, at 60 PSIG.

From the pipe data chart, for 2" schedule 40 pipe:

A_1 = 3.36 sq. in./144 = 0.023 ft²
A_2 = 0.622 ft²/ft x 125 ft = 77.8 ft² also: t_w = 40°F
d = 2.067 in./12 = 0.172 ft t_a = -15°F

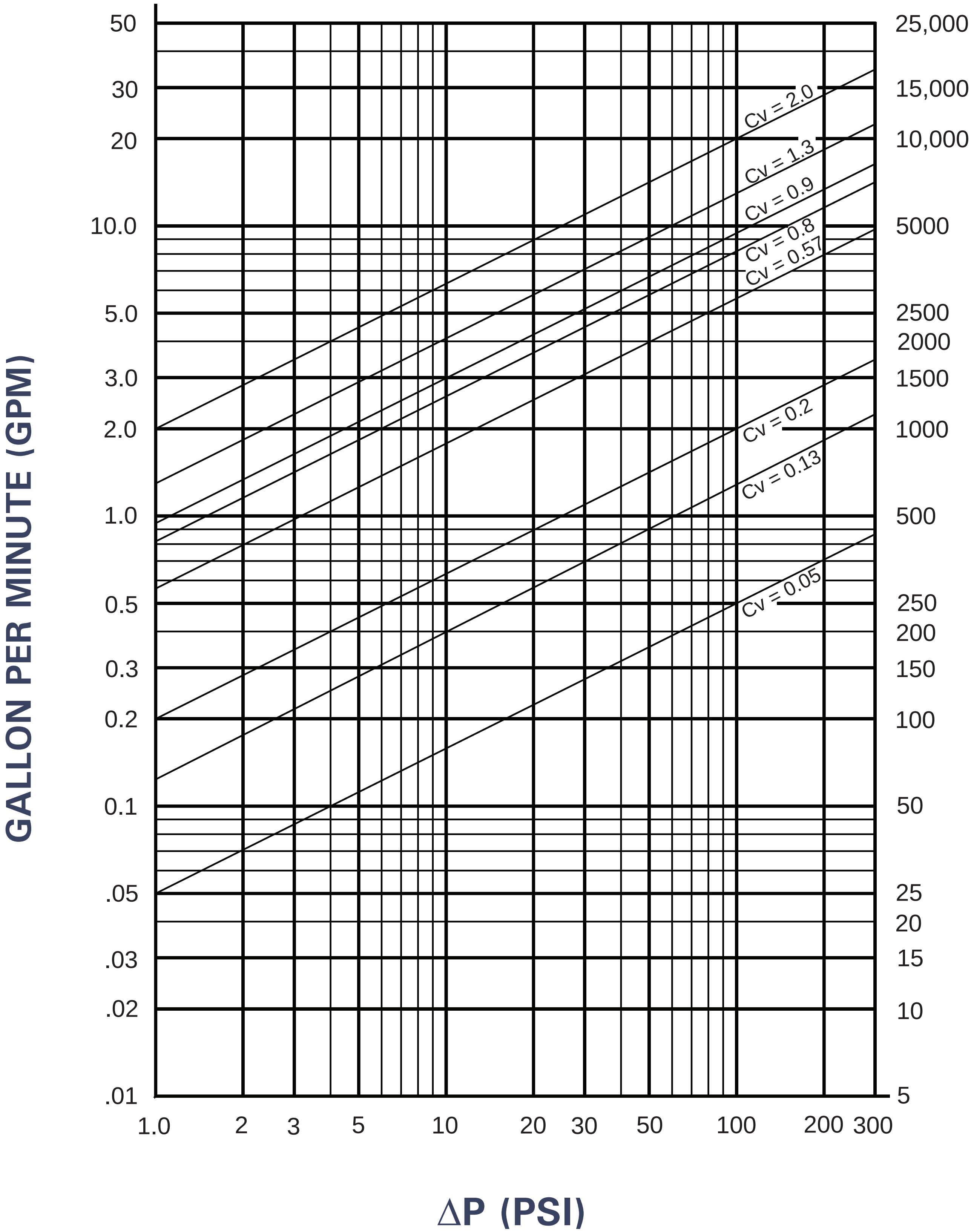
1) $$GPM = \frac{(0.023)(77.8)\,[(0.5)(40)-(-15)+16]}{40.1\,(0.172)^2\,(40-32)} = 9.6 \text{ GPM}$$

2) $$C_V = \frac{9.6 \text{ GPM}}{\sqrt{60\ \Delta P}} = 1.24^*$$

Choose the valve or valves required to give a C_V of 1.24 or more. The use of several smaller valves will provide redundancy. Valves must be installed as close to the far end of the pipe as possible. Any side branches must be individually protected.

*For properly insulated lines, use 25% of the C_V indicated as an approximation of required C_V

VALVE FLOW CAPACITIES



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