

## AIR & VACUUM VALVE SIZING

The sizing of an air valve is based on the resultant criteria of two operating conditions, that is, filling and draining the pipeline. Each grade must be independently considered in order to determine the most appropriate valve size. Air will be exhausted from the valve at the same rate at which the pipeline fills with a pressure differential maximum of 2psi across the valve.

### TO CORRECTLY SIZE AN AIR & VACUUM VALVE:

1. Determine liquid flow capacity in the pipeline.
2. Determine the exhaust flow capacity using the formula at top right.
3. Refer to curves with CFM and pressure differential for valve size required when filling the line.
4. Determine the valve size required to relieve a vacuum by admitting air through the valve. Chezy's formula at right determines the flow of water in a pipe due to gravity.
5. It may be necessary to consider the collapsing pressure of the pipe being vented due to vacuum formation. The steeper of the two grades should be used. For the Collapsing Pressure of Pipe Formula at right, a safety factor of 4 is used due to inconsistencies in the manufacture of pipe.
6. Refer to the curve with the required air capacity through the valve to relieve the vacuum and collapsing pressure of the pipe or 5 psi, whichever is lower. Pick off valve size.
7. Compare the valve sizes obtained for the exhaust flow and vacuum relief conditions, and select the larger valve size for the application.

### EXHAUST FLOW CAPACITY FORMULA

$$CFM = \frac{Q}{7.48 \text{ gallons/cu. ft.}}$$

Q = Flow in gallons per minute  
CFM = Cubic feet per minute of exhaust air

### CHEZY'S FORMULA

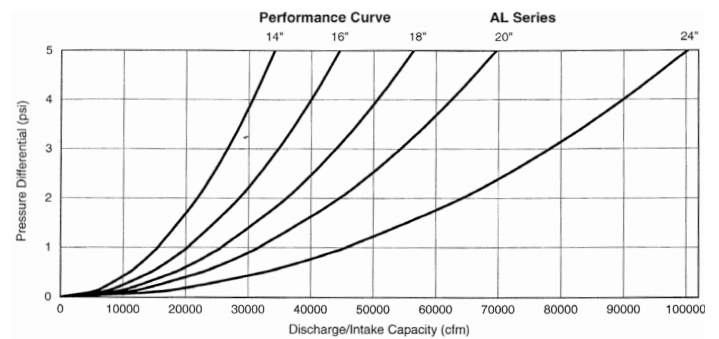
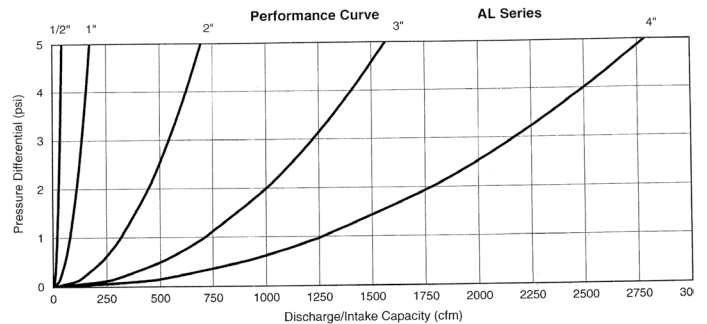
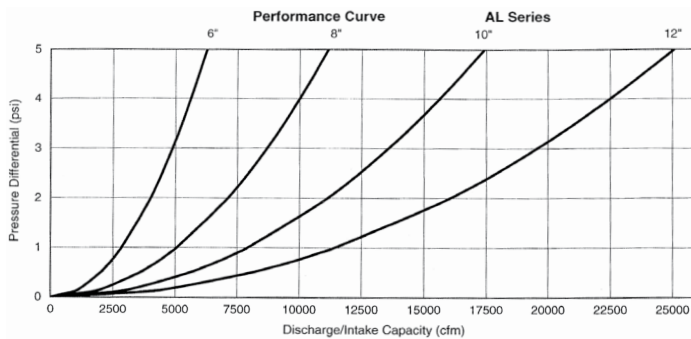
$$Q = \frac{C}{21.27} \sqrt{SD^5}$$

Q = Water flow in cu. ft. per minute  
(flow of water due to gravity = air flow thru valve)  
C = Chezy's coefficient (110 most commonly used)  
S = Slope of pipe (% expressed as decimal)  
D = Diameter of the pipe in inches

### COLLAPSING PRESSURE OF PIPE FORMULA

$$P = 16,250,000 \left( \frac{T}{D} \right)^3$$

P = Collapse Pressure (psi)  
T = Pipe Wall Thickness in inches  
D = Diameter of the pipe in inches



**PRODUCT LINE**  
AL SERIES AIR & VACUUM VALVE, 1/2" -24"  
**SHEET**  
Sizing Air & Vacuum Valves

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