SIMPLIFIED SELECTION OF AIR, GAS AND MIXTURE PIPING SIZE

Air, gas and mixture piping systems should be sized to deliver flow at a uniform pressure distribution and without excessive pressure losses in transit.

Two factors cause air pressure loss and consequent pressure variations:

1) Friction in piping and bends, and

2) Velocity pressure losses due to changes in direction.

In combustion work, piping runs are usually short (under 50 ft.), but often have many bends. By assuming that all velocity pressure is lost or dissipated at each change of direction and by using a pipe size to give a very low velocity pressure, other losses can be disregarded. In general, a velocity pressure of 0.3 to 0.5″ w.c. satisfies this need. This is equivalent to air velocities of about 2200 to 2800 ft/minute. For other gases, this velocity is inversely proportional to their gravities; consequently, higher velocities can be tolerated with natural gas, but propane and butane piping should be sized for lower velocities than air.

The accuracy of orifice meters is also sensitive to pipe velocity, so every effort should be made to keep velocity pressure below 0.3″ w.c. in metering runs.

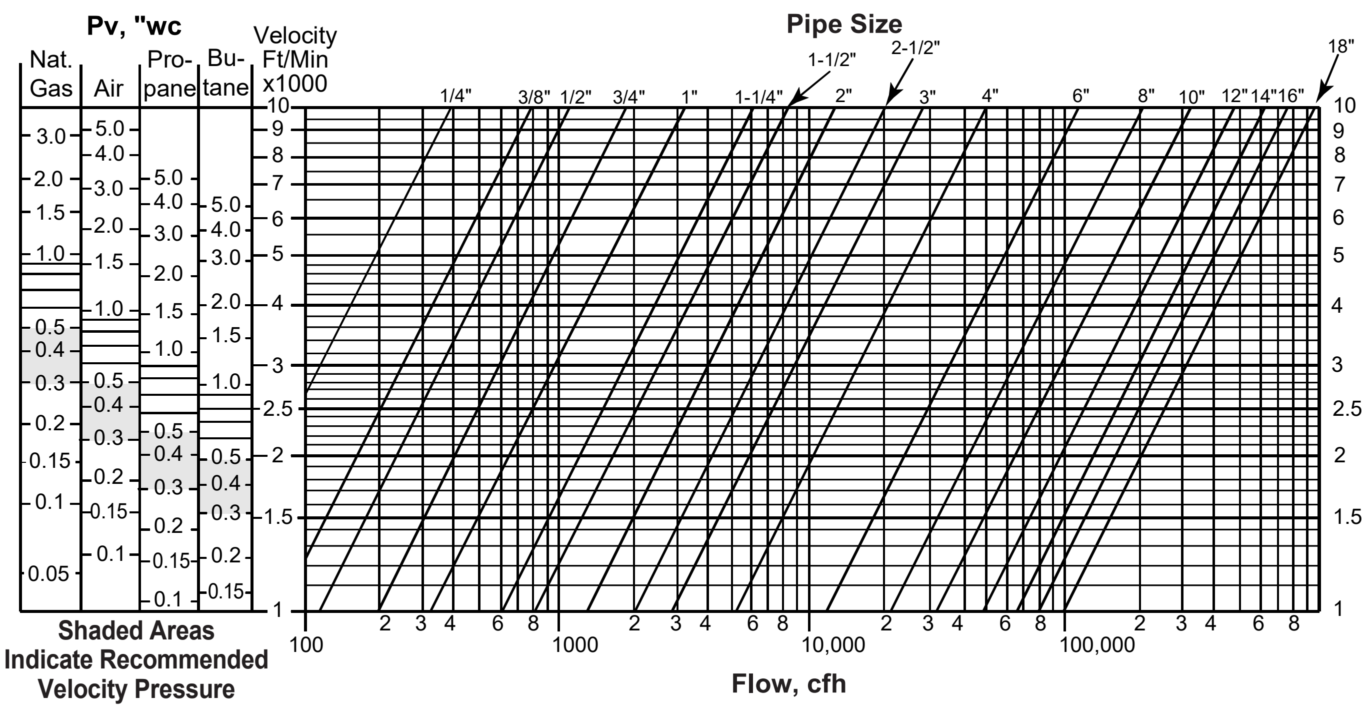
The graph below shows the relationship between velocity, velocity pressure and flow for various pipe sizes handling air, natural gas, propane, and butane. Because the specific gravity of most air-gas mixtures is close to that of air, mixture piping can be sized the same as air piping. The error will be insignificant.

Example: A burner requires 10,000 cfh air at a static pressure of 13″ w.c. The blower supplying this burner develops 15″ w.c. static pressure. Piping between the two will run 15 feet, including four 90° bends. What size piping is required?

Solution: Total pressure available for piping losses is
15″ w.c. - 13 ″ w.c. = 2″ w.c.

This allows a velocity pressure loss of:
2 ÷ 4 = 0.5″ w.c. for each of the four elbows.

Under the “Air” column on the left-hand side of the P_V graph, locate 0.5″ w.c. velocity pressure. This is equivalent to about 2800 ft/minute air velocity. Locate the intersection of the 2800 ft/minute line and the 10,000 cfh line, then drop down to the first curve below this point, in this case, 4″ pipe. This is the pipe size that should be used.



Shaded Areas Indicate Recommended Velocity Pressure Range

QUICK METHOD FOR SIZING AIR PIPING

If pipe sizing charts or tables aren’t available, you can quickly estimate the maximum air flow capacity of a pipe with these simple equations:

Maximum cfh air = (Nominal pipe size)^2 x 1000

The result will correspond to a velocity pressure of about 0.5″ w.c., the maximum recommended for low pressure air systems.

Optimum cfh air = (Nominal pipe size)^2 x 750

This will produce a flow rate equivalent to about 0.3″ w.c. velocity pressure.

Example: What is the maximum air flow rate for 2½" pipe?

(2½)^2 = 6.25
6.25 x 1000 = 6,250 cfh air.