

# Inlet Line Sizing Guidelines



As liquid flows through a hose or line, its speed or velocity is typically measured in feet per second. The liquid flowing through the inlet line equals the amount of liquid pumping through the pump during operation. Cat Pumps recommends limiting the maximum inlet line velocity to no more than 4 feet per second (ft/sec) to minimize turbulence and reduce the risk of cavitation.

## LINE SIZING FORMULAS

The formula used to determine the inlet line velocity is:

$$\text{Velocity (ft/sec)} = \frac{(\text{GPM} \times 0.4)}{\text{L}^2}$$

GPM = Liquid flowing through the inlet line measured in gallons per minute. Also, refers pump flow (5 gpm pump = 5 gpm flowing through the inlet line).

L = Inside diameter of the inlet hose or line measured in inches.

0.4 = Constant value calculated by reducing the units of measurement from gpm divided by area in in<sup>2</sup> into velocity in ft/sec.

Based on the recommended maximum inlet line velocity of 4 ft/sec, the maximum flow rate through any inlet line can be calculated with this formula:

$$\text{Max Flow} = 10\text{L}^2$$

## LINE SIZING RECOMMENDATIONS

Cat Pumps recommends that the bypass line from the primary pressure control device back to the pump's inlet line be no more than one size smaller than the inlet line size.

*Example:* 1" inlet line → ¾" bypass line

We also recommend that the discharge line from the pump be approximately one-half the size of the inlet line.

*Example:* 1" inlet line → ½" discharge line

The chart below gives guidelines for the maximum recommended flow rates through an inlet line of a given size based on the 4 ft/sec maximum velocity. It also lists the recommended bypass and discharge line sizes for each line size.

Inlet Line	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"
Maximum Flow (GPM)	2.5	5.6	10	15.6	22.5	40	62.5	90
Bypass Line	⅜"	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"
Discharge Line	¼"	⅜"	½"	¾"	¾"	1"	1 ¼"	1 ½"

## GENERAL RECOMMENDATIONS

When the recommended inlet line size is larger than the inlet port size of the pump, use a reducing fitting directly on the pump's inlet port to minimize turbulence.

Any inlet or bypass lines over 30 feet should be oversized to reduce frictional losses. Also, discharge lines longer than 100 feet should be oversized to eliminate unwanted pressure losses. Contact Cat Pumps to assist with accounting for long lines, excess frictional losses, and acceleration losses typically associated with long feed lines.