**Hose Selection**

⚠️ **WARNING**

For important safety information concerning hose selection, see page 4 of this catalog.

There are several factors which affect selection of a hose sized such that it will provide the desired rate of flow at the required pressure; these are:

- Hose size
- Hose length
- Hose ends
- Material conveyed
- Bends
- Static head pressure

### Hose Size

Undersized pressure lines produce excessive pressure drop with attendant energy loss and heating, and undersized suction lines cause cavitation at the pump inlet. Oversized hose assemblies, on the other hand, are excessively costly and generally too heavy.

In selecting hose for hydraulic systems, the following empirical values can be used to achieve minimum pressure drop consistent with reasonable hose size (see Chart 2):

- Velocity of pressure lines: 7 to 15 ft./sec.
- Velocity of suction lines: 2 to 5 ft./sec.

To use Chart 2, lay a straight-edge across the chart as shown by the dotted line. To minimize pressure drop, always use the next larger size hose shown if the line passes between sizes listed.

### Hose Length

Chart 1 gives the pressure drop in different-sized hoses based on hoses of 100-foot length, and is based on water as the material conveyed. For hoses of a different length, these values must be corrected. For example, a 100-foot length of 1/2" hose causes a pressure drop of 100 lbs./in.² at a flow rate of 10 gal./min. If the hose in question is 50 feet long, the pressure drop derived from Chart 1 must be corrected by multiplying the value by the ratio of the actual length to 100 feet, or 50/100, or 0.5. Therefore, the actual pressure drop caused by a 50-foot length of 1/2" hose, at a flow rate of 10 gal./min., is 50 lbs./in.²

### Hose Ends and Fluid Conveyed

In most cases, the end fitting openings are slightly smaller than the hose itself. However, this varies widely with hose end designs from 'full-flow' ends which have the same I.D. as the hose, down to as much as 1/8" smaller I.D. than the hose bore. To allow for this, assume a 10-to-15% greater flow rate than actually measured in the system when determining pressure drop.

Chart 1 is based on water as the material conveyed, and for other fluids it is necessary to correct for the difference in specific gravity and viscosity. Chart 3 lists common fluids, their specific gravities, viscosities, and corresponding correction factors.

To determine the pressure drop for a specific fluid, first determine the pressure drop from Chart 1 for the hose length then divide this by the correction factor found in Chart 3.

For example, the 50-foot length of 1/2" hose just described had a pressure drop of 50 lbs./in.² at a flow of 10 gal./min. of water. To determine the pressure drop if #2 fuel oil is the material conveyed, divide by 0.752 (from Chart 3)...

\[
50 \div 0.752 = 66.5 \text{ lbs./in.}^2
\]

If, on the other hand, the material conveyed is Type #3 gasoline, the pressure drop would be 50 ÷ 1.19 = 42 lbs./in.²
**APPLICATION**

LOW & MEDIUM PRESSURE HOSE

HIGH PRESSURE HOSE

SPECIALTY HOSE

ACCESSORIES & ASM'BLY INSTRUCTIONS

ADAPTERS & HOSE ENDS

HOSE ASSEMBLY

EQUIPMENT

TECHNICAL DATA

**CHART 4. Resistance of 90° Bends**

<table>
<thead>
<tr>
<th>Liquid</th>
<th>Specific Gravity</th>
<th>Viscosity</th>
<th>Centipoises</th>
<th>Corrected Factor #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic Acid - 100%</td>
<td>1.05</td>
<td>0.757</td>
<td>1.3</td>
<td>0.50</td>
</tr>
<tr>
<td>Acetic Acid - 70%</td>
<td>1.07</td>
<td>0.784</td>
<td>2.7</td>
<td>0.60</td>
</tr>
<tr>
<td>Ammonia fluid - 80%</td>
<td>0.86</td>
<td>1.290</td>
<td>3.0</td>
<td>0.60</td>
</tr>
<tr>
<td>Ammonia fluid - 76%</td>
<td>0.80</td>
<td>0.943</td>
<td>3.0</td>
<td>0.60</td>
</tr>
<tr>
<td>Asphalite - 100%</td>
<td>1.40</td>
<td>0.30</td>
<td>30.0</td>
<td>0.20</td>
</tr>
</tbody>
</table>

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**Bends**

If a hose of a given length is bent, the pressure drop will increase by some definite amount...the sharper the bend and the smaller the radius of bend the greater the pressure drop. The effect of a bend may be neglected if it is slight or if there are but few bends in a long length of hose. This is because the additional pressure drop caused by these bends is not significant when compared to the total pressure drop.

However, a dock hose may have four sharp 90° bends in a 25-foot length, and if pressure drop is important, these bends must be considered because they constitute a significant portion of the overall pressure drop.

The curves in Chart 4 show the effects of resistance due to 90° bends. This data can also be used as a guide for smooth bends less or greater than 90°. For example, a 45° bend has about 4/10 the resistance of a 90° bend.

**Problem:** Determine the equivalent length, in terms of hose inside diameters, of a 90° and a 180° bend whose relative radii are 12 inches.

**Solution:** Referring to the “total resistance curve,” the equivalent length for a 90° bend is 34.5 hose diameters. The equivalent length of a 180° bend is 34.5 diameters plus 18.7 diameters for resistance due to length, and 15.8 + 2 diameters for bend resistance. Adding these 34.5, 18.7 and 15.8 + 2 = 61.1 diameters for a 180° bend.* Note that this loss is less than the sum of losses through 90° bends separated by tangents.

**Static Head Pressure**

Static head is the difference in height between the inlet and outlet ends of a hose. Before using Chart 1, it is necessary to correct for static head pressure because the values in Chart 1 are pressure losses due to friction only.

To correct for static head pressure, the difference in height is determined and multiplied by 0.433 to convert the head to an equivalent pressure in PSI (one foot of water exerts 0.433 PSI pressure). If the inlet is higher than the outlet, the pressure equivalent is added to the pump pressure. If the outlet is higher than the inlet, the pressure equivalent is subtracted from the pump pressure. In both cases, it is assumed that the pump pressure is the pressure available at the inlet end and that the pump is outside of the hose system.

**Installation Design**

Hose should not be twisted or put in torsion either during the installation or while in service. Sharp or excessive bends may cause the hose to kink or rupture. Be sure to allow enough slack to provide for changes in length which will occur when pressure is applied. This change in length can vary from +2% to -4%.

Design the installation so the hose assembly is accessible for inspection and easy removal.*

*These figures are approximate or averages of those values drop.