HYDRAULICS
HOSE SELECTION BY FLOW RATE

Flow rate is a very important consideration in the hose selection process, for pressure lines as well as suction lines.

In a pressure line, if the hose has too small an inside diameter for the pump output, excessive velocity can result. Excessive velocity can cause several problems:

1. Hose tube errosion can seriously damage a hydraulic system, as rubber particles rapidly clog filters, valves, and cylinders. The results are expensive repairs and premature hose failure.
2. Excessive velocity causes a rapid rise in system temperature. High temperatures break down hydraulic fluids, causing pressure loss and lubrication failure.

When considering a suction line, getting **enough** fluid to the pump is the primary objective. The same problems exist as mentioned for pressure lines with one addition, pump cavitation.

Pump cavitation occurs when insufficient supplies of fluid becomes mixed with air, or gases from the fluid. When these bubbles enter the pressure cavity of the pump, they collapse rapidly causing noise, erosion, and finally, pump failure.

The recommended velocity ranges are:

Pressure Lines 7 to 15 ft. per sec. (FPS)
Suction Lines 2 to 4 ft. per sec. (FPS)

The nomograph will help in making the proper hose inside diameter selection based on pump output in gallons per minute (GPM).

The Example:

Pump Output = 12 GPM

Drawing a straight line from 12 GPM to the velocity range bracket on the right of the nomograph, we can select a hose ID from the center column where the line intersects.

Pressure Line = 3/4″ ID or Dash –12 size
Suction Line = 1 1/2″ ID or Dash –24 size

Hint: After selecting the pressure line size, we can calculate the suction line size by simply doubling the pressure line size. If we had selected a 1″ ID pressure line, a 2″ ID suction line would be correct.

Return Lines: The velocity through a return line to the reservoir should not exceed 8 - F.P.S., and is generally a larger ID than the pressure line to permit rapid evacuation of the system with a minimum of turbulance.

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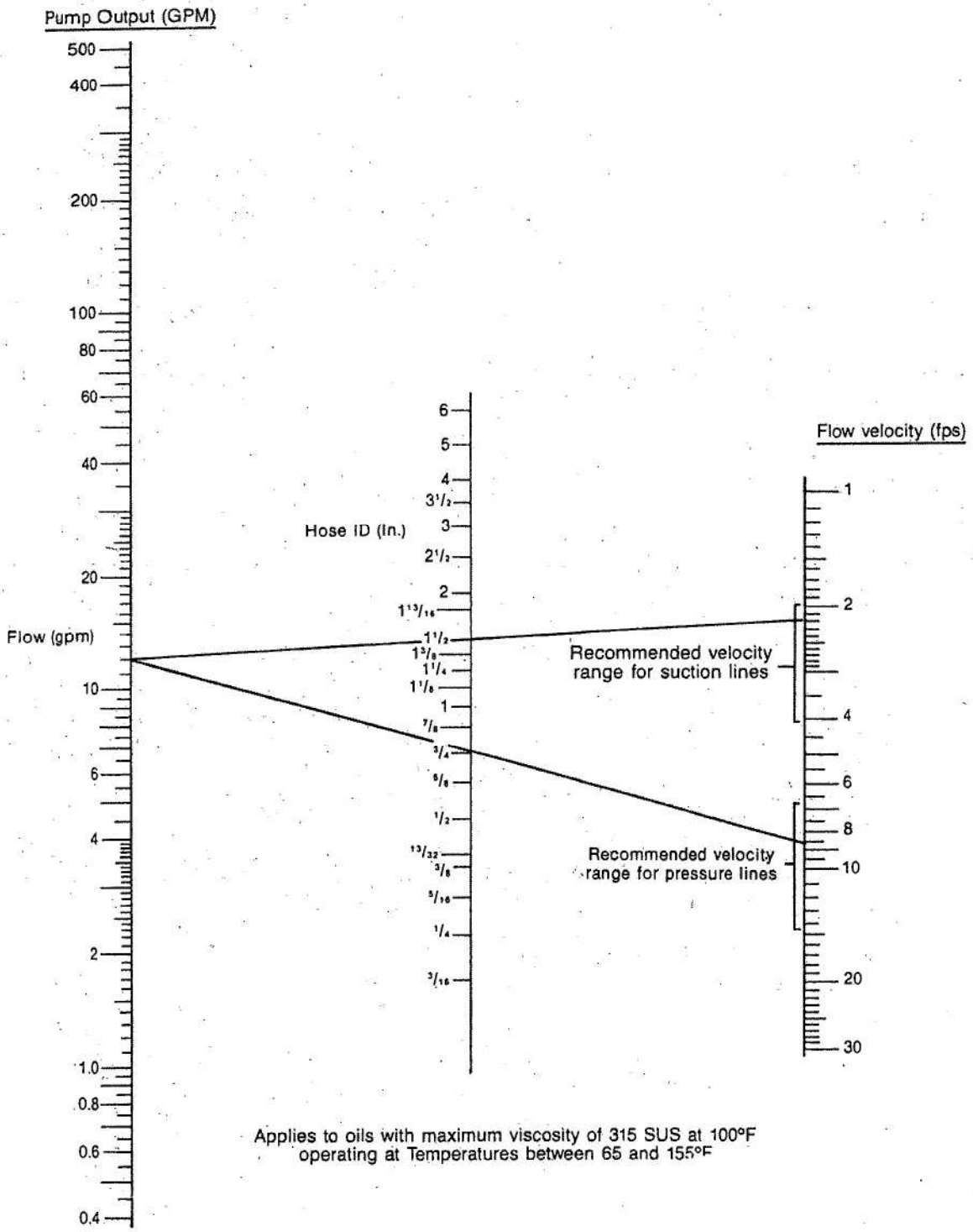
HOSE SELECTION BY FLOW RATE



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HYDRAULICS

HOSE SELECTION BY FLOW RATE

The following table represents the maximum flow rate in gallons per minute by hose I.D. for pressure lines and suction lines.

HOSE I.D. IN INCHES	MAXIMUM FLOW (GPM) PRESSURE LINES	MAXIMUM FLOW (GPM) SUCTION LINES
3/16	1.29	.35
1/4	2.30	.61
5/16	3.59	.96
3/8	5.16	1.38
13/32	6.06	1.62
1/2	9.18	2.45
5/8	14.35	3.83
3/4	20.66	5.51
7/8	28.12	7.50
1	36.72	9.79
1-1/8	46.48	12.39
1-1/4	57.38	15.30
1-3/8	69.43	18.51
1-1/2	82.63	22.03
1-13/16	120.64	32.17
2	146.89	39.17

Recommendations are for oils having a maximum viscosity of 315 S.S.U. at 100°F, operating at temperatures between 65° and 155°F.

$$V = \frac{.408 \times GPM}{D^2}$$

$$GPM = \frac{V \times D^2}{.408}$$

$$D = \sqrt{\frac{.408 \times GPM}{V}}$$

V = Velocity in FPS
D = Hose I.D. in inches
GPM = Flow Rate in gallons per minute

15 FPS is the maximum recommended fluid velocity for hydraulic systems. Under certain conditions, velocity in pressure lines can be increased. Please contact Dayco with specific application information.

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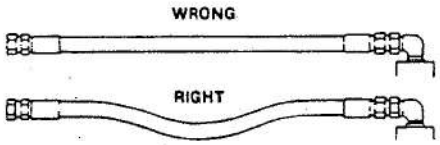
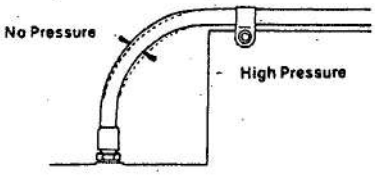
HYDRAULICS
CORRECT ASSEMBLY INSTALLATION

Satisfactory performance and appearance depend upon proper hose installation. Excessive length destroys the trim appearance of an installation and adds unnecessarily to the cost of the equipment. Hose assemblies of insufficient length to permit adequate flexing, expansion or contraction will cause poor power transmission and shorten the life of the hose.

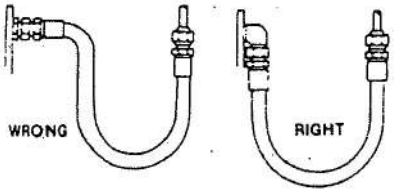
The diagrams below offer suggestions for proper hose installations to obtain the maximum in performance and economy.



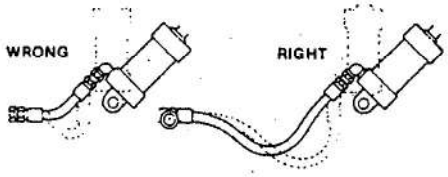
Since hose may change in length from +2% to −4% under the surge of high pressure, provide sufficient slack for expansion and contraction.



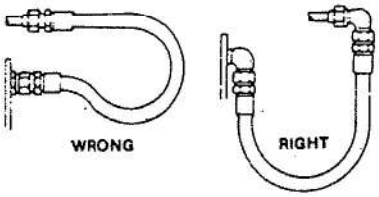
Due to changes in length when hose is pressurized, do not clamp at bends so curves absorb changes. Do not clamp high and low pressure lines together.



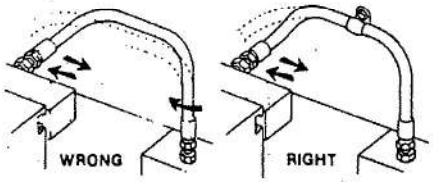
Avoid sharp twist or bend in hose by using proper angle adapters.



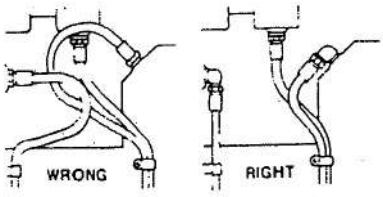
Adequate hose length is most important to distribute movement on flexing applications and to avoid abrasion.



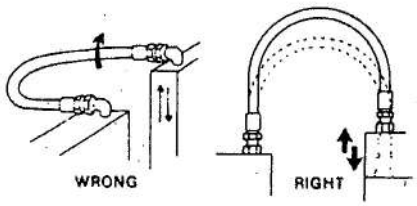
Where the radius falls below the required minimum, an angle adapter should be used as shown above to avoid sharp bends in hose.



To avoid twisting in hose lines bent in two planes, clamp hose at change of plane, as shown.



Obtain direct routing of hose through use of 45° and 90° adapters and fittings. Improve appearance by avoiding excessive hose length.



To prevent twisting and distortion, hose should be bent in the same plane as the motion of the boss to which the hose is connected.

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HYDRAULICS

CORRECT ASSEMBLY INSTALLATION (continued)

FIGURING LENGTHS

When determining the length of hose assemblies, provide enough length to prevent bending strain from localizing directly in back of the couplings. In the diagram, measurement "B" allows for a straight section of hose beyond the coupling to prevent concentration of bending strain.

"T" designates the amount of travel and "A" the smallest diameter in which hose should be bent.

Typical Dimensions for One- and Two-Wire Braid Hose. If bending diameters other than those shown below are used, apply the following formulas:

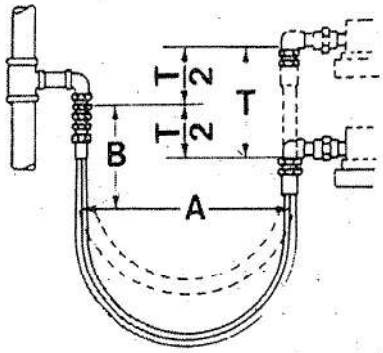

Figure 1: Overall length = B + 1.57A + ½T

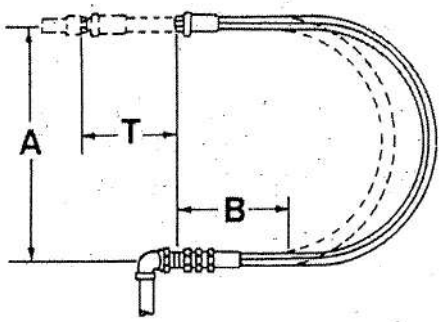

Figure 2. Overall length = B + 1.57A + T

Hose I.D.	"B" Constant for Straight Portion Including Coupling	Minimum "A"	Minimum Overall Length	
			Figure 1	Figure 2
3/16	10"	8"	23" + ½T	23" + T
1/4	10"	8"	23" + ½T	23" + T
3/8	10"	10"	26" + ½T	26" + T
1/2	12"	14"	34" + ½T	34" + T
3/4	14"	19"	44" + ½T	44" + T
1	16"	22"	51" + ½T	51" + T
1 1/4	18"	32"	68" + ½T	68" + T
1 1/2	20"	44"	87" + ½T	87" + T
2	20"	48"	95" + ½T	95" + T

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