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Refrigerant Line, Sizing: Determining Equivalent Length using Pipe Diameters

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whether it's Air Conditioning or Refrigeration SERVICING KNOW-HOW

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Refrigerant Line Sizing: Determining Equivalent Length using Pipe Diameters

When sizing refrigerant lines, it is necessary to account for pressure drop created by both the length of piping and the fittings used. The pressure drop from the fittings is accounted for by determining their "equivalent length".

Equivalent length is defined as the length of straight pipe having the same energy loss as a fitting.

The length we use to size a refrigerant line must be the total length of straight piping plus the equivalent length of all the fittings used:

$$L_T = L_S + L_{EQ}$$

where:

 L_T = total effective length L_S = length of straight pipe

 L_{EQ} = equivalent length of the fittings

Equivalent length may be calculated using the following equation:

$$L_{EQ} = \frac{KD}{f}$$

where:

K = minor loss coefficient D = pipe diameter f = friction factor

However, both K and f are influenced by a number of factors. Fortunately, a simpler method using "pipe diameters" may be used which eliminates the need to determine K and f. Generally accepted pipe diameters for various fittings are listed below:

Fitting Type		Pipe Diameter (L _{EQ} /D)
P	90° short radius, R/D = 1	30
ſ	90° long radius, R/D = 1.5	20
ſ	90° street	50
	45°	16
	45° street	26
	Tee, flow straight thru	20
	Tee, flow thru branch (side)	60

As an example, a 5/8" 90° street elbow will have an equivalent length of: 50 * 0.625 / 12 = 2.6 ft. The fitting **Education is Just the Beginning**



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size in inches is divided by 12 to convert equivalent length from inches to feet.

Refrigerant Line Sizing Example

It is desired to size a liquid line for a refrigeration system having the following design conditions:

R-404A evaporator temperature: -20°F liquid temperature: 60°F 4 tons

It is determined the liquid line will consist of 160 ft of straight sections and (12) 90° short radius elbows. In this example, we will assume no vertical lift.

Using the Sporlan product selection program to select line size, we find it selects a 5/8" OD line size at a 2.4 psi pressure drop if we simply enter 160 ft for line length.

If we add the equivalent length of (12) 5/8" ODF 90° short radius elbows to the straight line length, we get:

160 + 12 * (30 * 0.625 / 12) = 179 ft

Using this value in the program, it again selects a 5/8" OD line size, but this time the pressure drop is 2.7 psi.