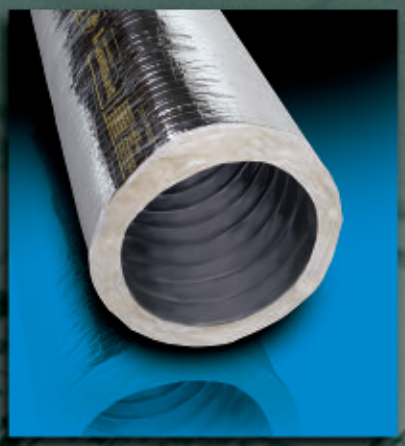
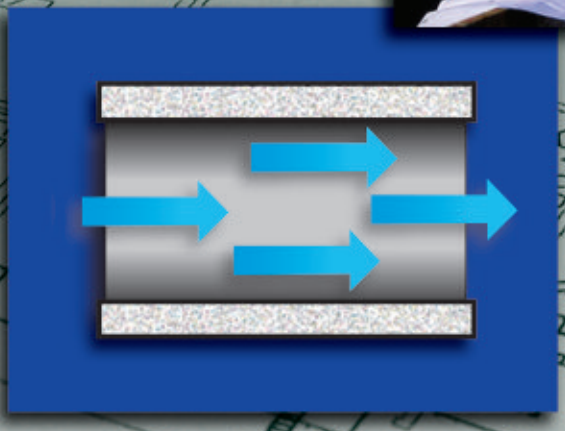
Thermaflex®

FLEXIBLE DUCT APPLICATION INFORMATION

Air Flow and Air Friction





Air Flow Tests and Air Friction Data

Air Diffusion Council Flexible Air Duct Test Code FD-72 R1

Thermaflex considers the Air Diffusion Council Flexible Air Duct Test Code FD-72 R1 as the most dependable standard pertaining specifically to flexible ducts and air flow. Therefore, our air flow and friction loss tests have been conducted in full conformity with ADC FD-72 R1. Our goal is to present data as accurately and reliably as possible for flexible ducts.

Use of Air Diffusion Council Test Code provides data most nearly approaching results which can be expected under field operating conditions, providing flexible ducts are installed properly; e.g., suspended or supported properly to avoid sagging or kinking, use of accurate lengths to eliminate "snaking" of excess ducting between connecting points or use of other careful, workmanlike practices.

Test Standards and Test Equipment

Thermaflex Air Duct Data have been obtained in accordance with the Air Diffusion Council Flexible Air Duct Test Code 72 R1 and ASME Power Test Code PTC 19.5.4 – 1959. (See Chapter 4, "Flow Measurement," Part 5 – "Measurement of Quantity of Materials.") ADC FD72 R1 Air Duct Test Code specifies the instruments and apparatus specifically for air frictions loss determination.

Test Procedures – Straight Run and 90° Bends

Preparation and installation of test specimens conform to the instructions stated in the Flexible Air Duct Test Code. Two test procedures are required, one for straight runs, and another for 90° bends. Briefly stated, for the straight run tests, the air friction loss is determined by measuring the pressure losses of the duct with air flowing at several rates. Air friction loss in 90° bends is the net difference between the total pressure loss of a duct installed in a 90° bend and the straight run losses upstream and downstream of the bend.

Test Results and Presentation of Data

Test data is presented to be a standardized air density of .075 pounds per cubic foot.

Data for straight run ducts are presented graphically as pressure loss in inches of water per 100 feet of duct, as shown on the charts in this brochure.

Air friction loss of 90° bends depends on the bend radius, and it is shown graphically as equivalent length of straight duct in terms of duct diameters versus the ratio of centerline bend radius to duct diameter.

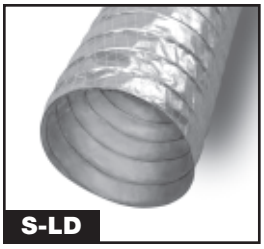
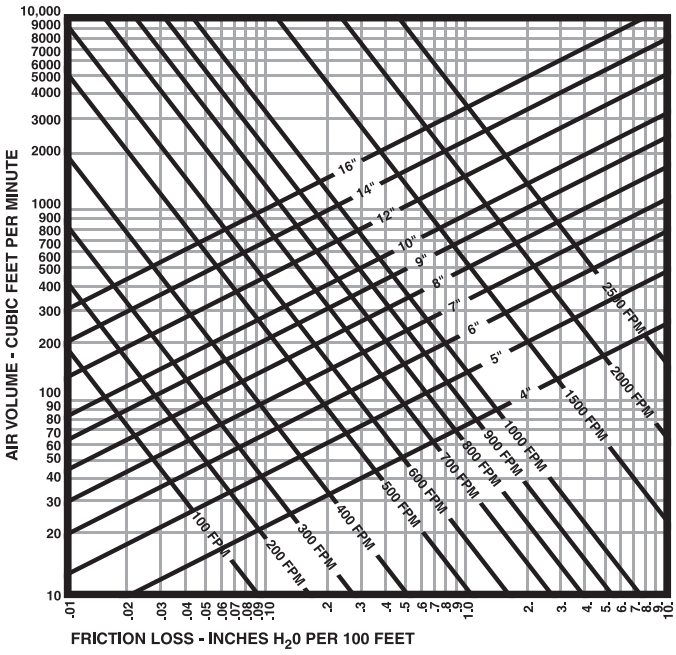


CHART 1 – THERMAFLEX M-KE, G-KM

Flexible Duct – Straight Run

Friction Loss per 100 ft.



Use of Air Friction Charts and Related Data

Ducts in Straight Runs

Air Volume in cubic feet per minute (CFM) is plotted vertically along left side of charts: Friction Loss in inches of water (In H_20) per 100 feet of straight duct is plotted horizontally along bottom of charts: Duct Sizes as inside diameters (ID inches) are shown on the diagonal lines sloping upward from left to right: Air Velocity in feet per minute (FPM) is shown along the diagonal lines sloping upward from right to left.

One method for using charts is: Supposing Air Volume is known at 600 CFM through an 8" ID Thermaflex M-KC. In this case, use Chart No. 3 and locate the 600 CFM line at intersection with 8" ID line; read downward to Friction Loss line and note loss as 1.0 In. H_20 per 100 feet. Supposing actual straight duct length is known to be 15 feet, then calculate accordingly to arrive at Friction Loss of .15 In. H_20 for 15 feet.

A second method for using charts is: Supposing Air Velocity is known at 1000 FPM through 6" ID Thermaflex M-KE. In this case, use Chart No. 1 and locate the diagonal 1000 FPM line at intersection with 6" ID line; then read downward vertically to Friction Loss line and net loss as .8 In. H_20 per 100 feet. Supposing actual straight duct length is known at 12 feet, then calculate accordingly to arrive at Friction Loss of .1 In. H_20 for 12 feet.

A third way for using charts and related data is determining Air Velocity (FPM) through given Duct Size when Air Volume (CFM) is known. Supposing Air Volume is known at 600 CFM and Duct Size is 8 inches ID. In this case, divide 600 CFM by .3490 square feet Duct Cross Section Area for 8 inches ID duct to arrive at 1719 FPM Air Velocity. Converting Air Velocity to Air Volume is calculated by multiplying FPM by Duct Cross Section Area (See Duct Cross Section Areas Table).

Ducts in Bends

Air friction for ducts in bends is determined by first finding the Duct Radius Ratio (R/D) by dividing R (Center Line Bend Radius) by D (Duct Diameter). For example, 8" diameter duct installed on 16" centerline bend radius has R/D of 2.

Equivalent Lengths of Straight Duct in Diameters can be found quickly by using Bend Friction Loss. Continuing the example: by locating R/D of 2 intersecting the cure and reading to the left, 20" diameters of 8" duct (160" or 13.3 feet) is seen as the Equivalent Length of Straight Duct.

Air Friction Loss can then be calculated from the charts and information given for Ducts in Straight Runs.

CHART 2 – THERMAFLEX M-KC, S-LP-10, S-TL

Flexible Duct – Straight Run
Friction Loss per 100 ft.

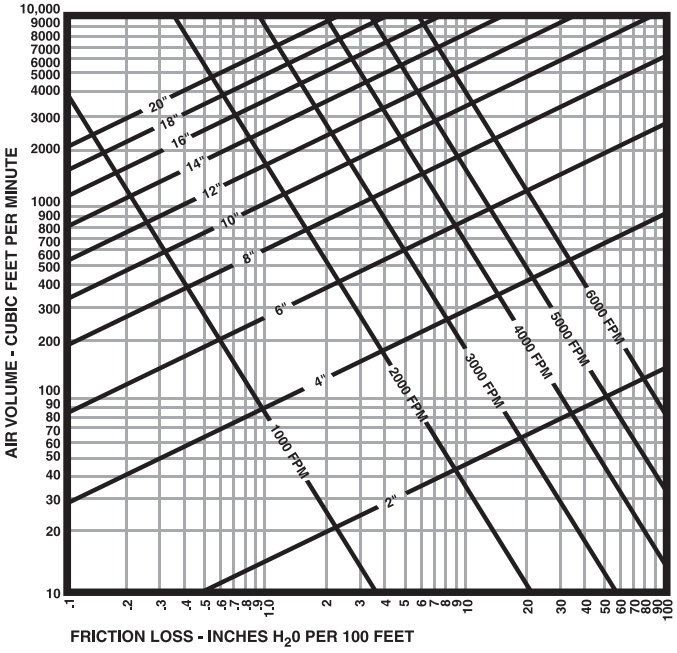
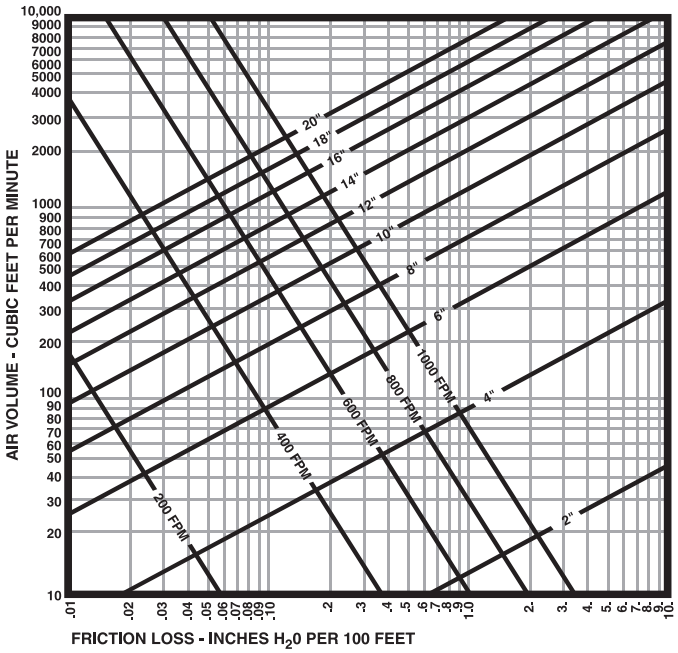


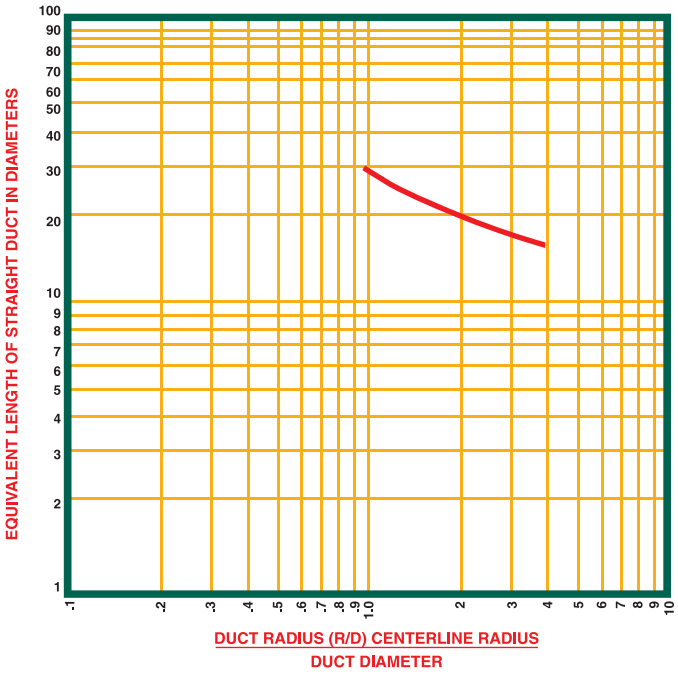
CHART 3 – THERMAFLEX M-KC, S-LP-10, S-TL

Flexible Duct – Straight Run
Friction Loss per 100 ft.



Flexible Air Duct Data for Bends

Flexible Duct – Bend Friction Loss



NOMINAL DUCT AREAS TABLE

Duct Inside Diameter (inches)	Duct Cross-Section Area (sq. ft.)
2	.0218
3	.0491
4	.0873
5	.1363
6	.1963
7	.2672
8	.3490
9	.4418
10	.5454
12	.7854
14	1.0690
16	1.396
18	1.767
20	2.182

USE OF BEND LOSS COEFFICIENTS

The loss coefficients (C_o) tabulated are actual test values obtained on 12 inch nominal duct diameters. Pressure loss (ΔP) in 90° bends can be calculated using pressure loss coefficients (C_o) in the following formula:

$$\Delta P = (C_o)\left[\rho\left(\frac{V}{1097}\right)^2\right]$$

ρ = 0.075 lb./f^3 (density of air)
V = fpm (velocity of air)
ΔP = in w.g. (pressure loss of the 90° bend)

PRESSURE LOSS COEFFICIENTS (C_o) in 90° BENDS

Centerline Bend Radius Ratio R/D	1.0	2.5	4.0
Thermaflex M-KE, G-KM	0.82	0.82	0.86
Thermaflex M-KC, S-LP-10, STL (C_o)	0.84	0.85	0.87

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