

AIR PERFORMANCE DATA FOR ALL STATIC AND DYNAMIC FIRE DAMPERS

PRESSURE DROP DATA

The air performance of a damper is described by the pressure drop across the damper. So what is pressure drop? Pressure drop can be defined as the resistance to airflow across an open damper and increases as turbulent flow increases. Pressure drop is figured using one of the three arrangements found below. Ruskin's pressure drop testing was conducted in accordance with AMCA Standard 500 using figure 5.3 shown. All data has been corrected to represent standard air at a density of .075 lb/ft³. Actual pressure drop found in any HVAC system is dependent upon many factors. This pressure drop information along with an analysis of other system influences should be used to estimate actual pressure losses for a damper installed in a given HVAC system.

AMCA TEST FIGURES

Figure 5.3 illustrates a fully ducted damper. This configuration has the lowest pressure drop of the three test configurations.

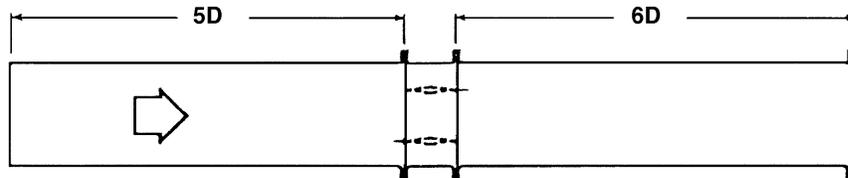


Figure 5.3

Figure 5.2 illustrates a ducted damper exhausting air into an open area. This configuration has a lower pressure drop than Figure 5.5

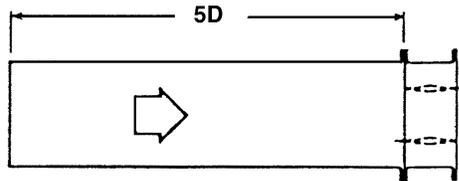


Figure 5.2

$$D = \sqrt{\frac{4(W)(H)}{3.14}}$$

Figure 5.5 illustrates a plenum mounted damper. This configuration has the highest pressure drop.

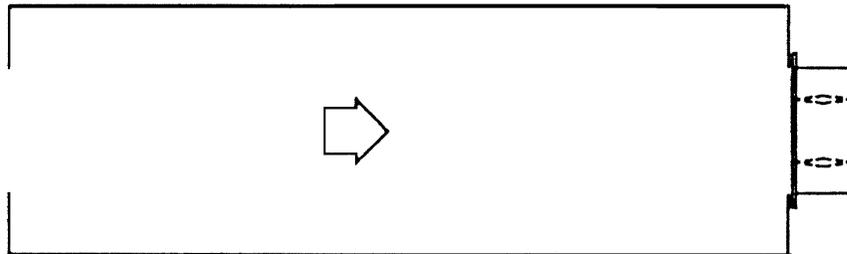


Figure 5.5

PERFORMANCE DATA FOR (D)IBD STYLE 'A'

NOTES:

1. Ratings are based on AMCA Standard 500 using test set up apparatus figures 5.3 (damper installed with duct upstream and downstream).
2. Static pressure and conversion velocities are corrected to .075 lb./cu. ft. air density.
3. For installations where damper is not installed in ductwork such as return air from ceiling plenum through fire damper into return air shaft, multiply static pressure drop obtained from the table below by $2.8 + \sqrt{1 \div \text{AREA FACTOR}}$

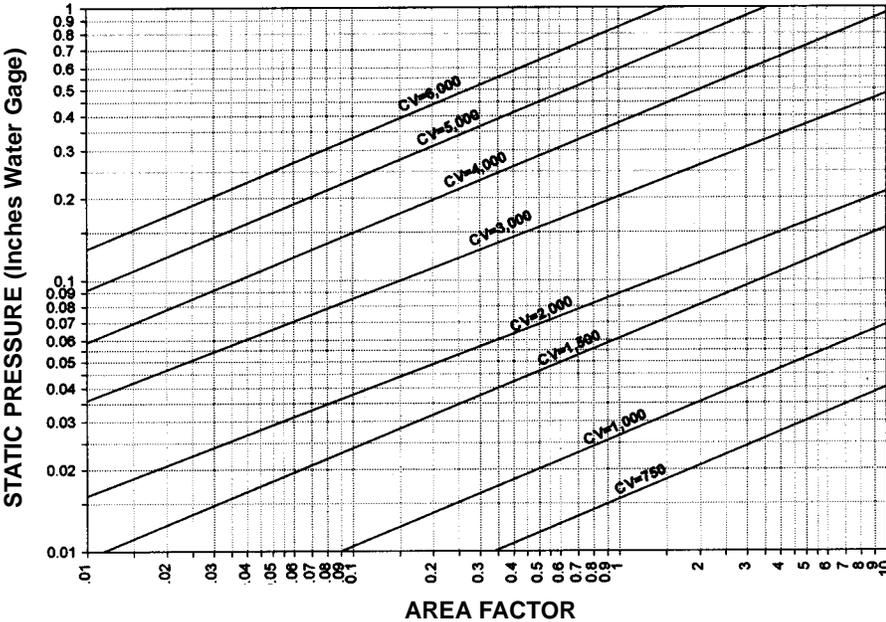
To determine the pressure drop:

1. Determine area factor for the damper based on the duct width and height (A x B) using the appropriate chart based on damper style.
2. Find the conversion velocity (CV) by multiplying area factor for the selected size damper by flow rate in CFM.
3. Locate the area factor at bottom of the pressure drop chart. Move up the chart to the appropriate conversion velocity (CV) line. From the intersection point, move left to pressure drop at left side of the chart.

AREA FACTOR TABLE

Ht. Dim. B	Width - Dimensions A															
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96
6	8.33	3.57	2.27	1.64	1.30	1.14	.943	.820	.725	.649	.588	.546	.505	.469	.433	.407
8	5.88	2.56	1.61	1.19	.943	.806	.675	.595	.526	.472	.427	.397	.365	.337	.314	.292
10	4.55	1.96	1.25	.917	.719	.625	.526	.459	.403	.360	.324	.306	.280	.258	.240	.225
12	3.57	1.52	.971	.709	.562	.485	.410	.355	.313	.281	.254	.236	.217	.201	.187	.175
16	2.63	1.14	.719	.526	.417	.360	.305	.263	.232	.208	.189	.175	.162	.149	.139	.129
20	2.08	.901	.571	.420	.331	.286	.242	.210	.185	.166	.150	.140	.128	.119	.110	.103
24	1.75	.746	.474	.348	.275	.237	.201	.174	.152	.136	.122	.116	.106	.099	.092	.086
28	1.49	.637	.406	.298	.235	.203	.172	.149	.131	.117	.106	.099	.091	.084	.078	.073
32	1.30	.555	.355	.260	.205	.177	.150	.130	.115	.103	.093	.087	.080	.074	.068	.064
36	1.14	.488	.311	.227	.180	.155	.132	.114	.100	.090	.081	.076	.070	.064	.060	.056
42	.971	.417	.265	.195	.154	.133	.113	.097	.086	.077	.069	.065	.060	.055	.051	.048
48	.855	.366	.233	.171	.135	.116	.099	.085	.075	.067	.061	.057	.052	.048	.045	.042
54	.758	.325	.207	.152	.120	.103	.087	.076	.067	.060	.054	.051	.046	.042	.040	.037
60	.685	.293	.186	.137	.108	.093	.079	.068	.060	.054	.049	.046	.042	.039	.036	.034
66	.613	.264	.168	.123	.097	.084	.071	.062	.054	.049	.044	.041	.038	.035	.032	.030
72	.565	.242	.154	.113	.089	.077	.065	.056	.050	.045	.040	.038	.035	.032	.030	.028

CONVERSION VELOCITY



IBD PERFORMANCE EXAMPLES:

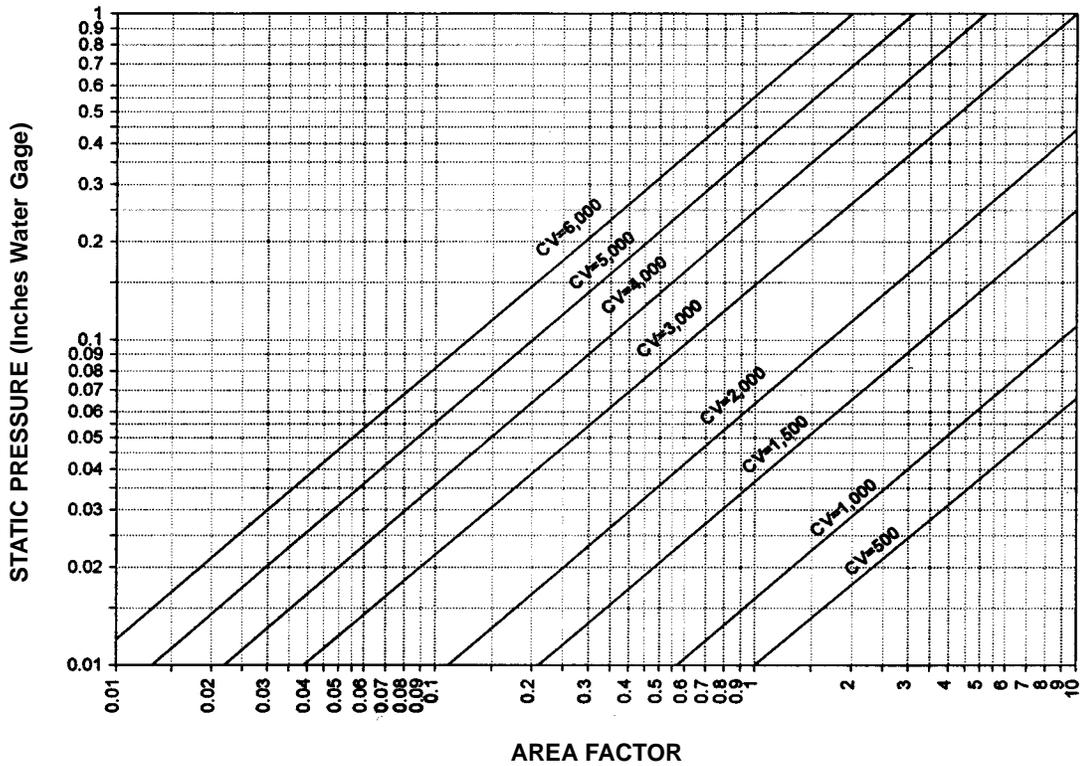
1. Find the pressure drop across a 24" x 24" (610 x 610) IBD2 A style fire damper handling 5747 CFM. From the table, the area factor is 0.348 = 2,000. From the chart, pressure drop = .065" w.g.
2. Find the pressure drop across a 30" x 26" (762 x 660) IBD2 A style fire damper handling 6383 CFM. From the table, the area factor is 0.235. The conversion velocity = CFM x area factor = 6383 x 0.235 = 1500. From the chart, pressure drop = .034" w.g.

PERFORMANCE DATA FOR (D)IBD STYLE B

AREA FACTOR TABLE

Dim. B	Width - Dimension A																				Dim. B				
	6	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84		88	92	96	99
6	6.10	2.85	2.08	1.67	1.37	1.18	1.02	.909	.813	.741	.676	.625	.578	.541	.505	.476	.448	.426	.403	.385	.366	.351	.336	.326	6
8	4.41	1.96	1.45	1.15	.952	.813	.709	.629	.581	.513	.469	.433	.402	.375	.349	.329	.311	.294	.279	.266	.254	.243	.233	.226	8
10	3.46	1.52	1.11	.877	.730	.621	.541	.481	.431	.392	.358	.330	.307	.286	.268	.252	.236	.225	.214	.204	.194	.186	.178	.173	10
12	2.84	1.22	.901	.714	.588	.503	.439	.389	.350	.317	.290	.267	.248	.232	.217	.204	.192	.182	.173	.165	.157	.150	.144	.140	12
16	2.10	.885	.649	.516	.427	.365	.318	.282	.253	.229	.210	.194	.180	.166	.157	.148	.139	.132	.125	.119	.114	.109	.104	.101	16
20	1.66	.689	.510	.405	.334	.286	.249	.221	.198	.180	.165	.152	.141	.131	.123	.116	.109	.103	.098	.093	.089	.085	.082	.079	20
24	1.38	.568	.420	.332	.276	.235	.205	.182	.163	.148	.136	.125	.116	.108	.101	.095	.090	.085	.081	.077	.073	.070	.067	.065	24
28	1.17	.483	.356	.283	.234	.199	.174	.154	.139	.126	.115	.106	.098	.092	.086	.081	.076	.072	.069	.065	.062	.060	.057	.055	28
32	1.02	.420	.310	.245	.203	.173	.151	.134	.120	.109	.099	.092	.085	.080	.075	.070	.066	.063	.060	.057	.054	.052	.050	.048	32
36	.907	.370	.274	.217	.180	.153	.134	.118	.106	.097	.088	.081	.076	.070	.066	.062	.059	.056	.053	.050	.048	.046	.044	.042	36
40	.815	.332	.245	.194	.161	.137	.120	.105	.095	.087	.079	.073	.068	.063	.059	.056	.052	.050	.047	.045	.043	.041	.039	.038	40
44	.740	.301	.222	.176	.146	.124	.108	.096	.086	.078	.072	.066	.061	.057	.054	.050	.048	.045	.043	.041	.039	.037	.036	.035	44
48	.677	.276	.203	.161	.133	.114	.099	.088	.079	.072	.066	.060	.056	.052	.049	.046	.044	.041	.039	.037	.035	.034	.033	.032	48
52	.624	.253	.187	.148	.123	.105	.091	.081	.073	.066	.060	.056	.052	.048	.045	.042	.040	.038	.036	.034	.033	.031	.030	.029	52
56	.579	.236	.173	.137	.114	.097	.085	.075	.067	.061	.056	.052	.048	.045	.042	.039	.037	.035	.033	.032	.030	.029	.028	.027	56
60	.540	.219	.161	.128	.106	.090	.079	.070	.063	.057	.052	.048	.046	.042	.039	.037	.036	.033	.031	.030	.028	.027	.026	.025	60
64	.506	.205	.151	.120	.099	.085	.074	.065	.059	.053	.049	.045	.042	.039	.036	.034	.032	.031	.029	.028	.026	.025	.024	.023	64

PRESSURE DROP CONVERSION VELOCITY



PERFORMANCE DATA FOR (D)IBD STYLE C, CR, CO, LR, LO, R

To determine the pressure drop through an IBD fire damper CR style:

1. Locate the line representing the diameter of the damper.
2. Move along the diameter line to the appropriate air flow in CFM.
3. From the intersection point, move down the chart to find the static pressure at the bottom.
4. Multiply the static pressure by the appropriate sleeve length correction factor to obtain pressure drop.

To determine the pressure drop through an IBD fire damper C or CO style:

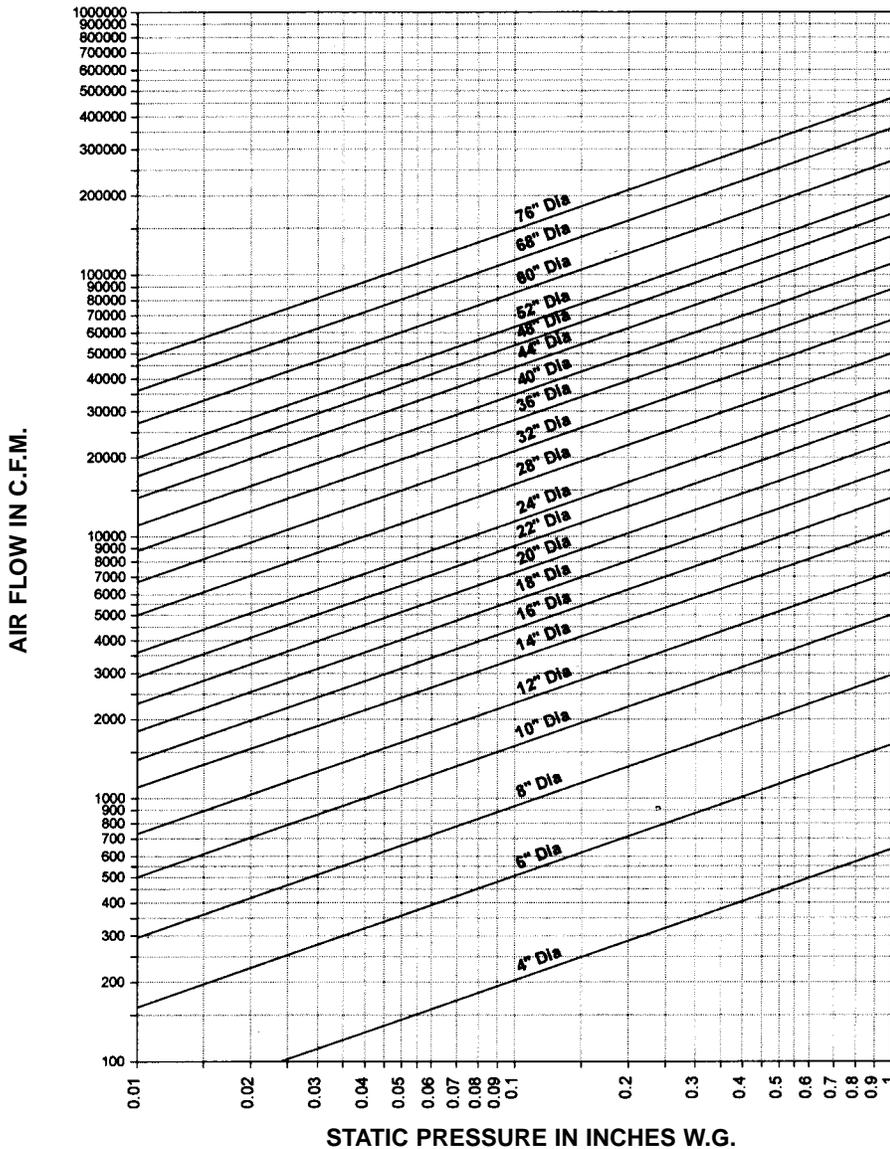
1. Convert dimensions to circular equivalents using the following formulas:

For C style: $D = 1.13 \sqrt{A \times B}$

For CO, LO style: $D = 1.13 \sqrt{(A \times B) - (.22 \times B \times B)}$

2. Using equivalent diameter, following CR style directions.

PRESSURE DROP CHART
(D)IBD STYLE CR, LR, R WITH 16" FACTORY-STANDARD SLEEVE



Use the chart and correction factors to determine pressure drop through Ruskin IBD2 Style CR (round) Fire Dampers. Multiply static pressure from chart by appropriate correction factor to obtain pressure drop. Style C (square and rectangular) and Style CO (oval) dimensions must be converted to circular equivalents before using Pressure Drop Chart.

Example – Find the pressure drop across a 12" (305) diameter Type IBD2 Style CR without sleeve handling 2000 CFM. From the chart, static pressure is found to be .073 in. w.g. Correction factor for damper without sleeve is .01. Therefore pressure drop is .073 in. w.g. x .01 = .00073 in. w.g.

CORRECTION FACTORS

Damper without sleeve	.01
Damper with 12" (305) sleeve	.99
Damper with 16" (406) sleeve	1.00
Damper with 24" (610) sleeve	1.01

NOTES

1. Ratings are based on AMCA Standard 500 using Test Setup Apparatus Figure 5.3 (damper installed with duct upstream and downstream).
2. Static Pressure and CFM are corrected to .075 lb./cu. ft. air density.
3. Convert square, rectangular or oval damper sizes to circular equivalents (equivalent round duct sizes) as described in the ASHRAE Handbook of Fundamentals. Equivalent round conversions are also available from most duct calculators and spiral duct manufacturer's literature.

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