



AERODYNAMIC PERFORMANCE

The flow area through the silencer must be sufficient to accommodate the maximum flow without imposing excessive pressure drop. The following instructions enable the user to 1) select proper silencer size, and 2) determine the actual pressure drop. (These instructions assume air as the flowing gas. For other gasses, density and other corrections may be necessary - contact Commercial Acoustics for assistance.)

Data Required:

- Air flow Rate (Actual CFM)
- Temperature (°F.)
- Pressure (psig)
- Maximum Pressure Drop (inches of water)

1. Determine Maximum Velocity:

$$V = 4005 \sqrt{\left(\frac{\Delta P}{c}\right) \left(\frac{14.7}{P + 14.7}\right) \left(\frac{T + 460}{530}\right)}$$

- V = Air or gas velocity, ft/min (see Note 1)
- ΔP = Maximum pressure drop, inches of water
- c = Silencer pressure drop coefficient (Tbl. 1)
- T = Air temperature, °F.
- P = Operating pressure, psig. (If at atmospheric pressure, pressure ratio is unity and may be omitted from equation. If P exceeds 15 psig, contact Commercial Acoustics for recommendations.)

Table 1. Pressure Drop Coefficients

SILENCER	PRESSURE DROP COEFFICIENT-c
CASTP & CASTE	.25
CA5	.75
CA3 & CA4	.85

NOTES:

1. Since self noise and aerodynamic noise generation increase with velocity, absorptive silencers are usually sized for 4,000 - 8,000 ft./min. In no case should the velocity exceed 15,000 ft./min., regardless of pressure drop allowed.

2. Determine flow area required:

$$A = \frac{Q}{V}$$

- A = Flow area, Ft. ²
- Q = Air flow (Actual CFM)

$$\text{Actual CFM} = \text{Standard CFM} \left(\frac{14.7}{P + 14.7}\right) \left(\frac{T + 460}{530}\right)$$

3. From Table 2, select size with flow area equal to or greater than that calculated.

4. Determine actual pressure drop:

$$\Delta P = c \left(\frac{V \text{ Actual}}{4005}\right)^2 \left(\frac{530}{T + 460}\right) \left(\frac{P + 14.7}{14.7}\right)$$

$$V \text{ actual} = \frac{Q}{A}$$

Table 2. Flow Area Size

Dia. (Size)-in.	Flow Area-ft ²	Dia. (Size)-in.	Flow Area-ft ²
1/2	.0014	22	2.6
3/4	.0031	24	3.1
1	.0055	26	3.7
1 1/2	.012	28	4.3
2	.022	30	4.9
2 1/2	.034	32	5.6
3	.049	34	6.3
3 1/2	.067	36	7.1
4	.087	38	7.9
5	.136	40	8.7
6	.196	42	9.6
8	.349	44	10.6
10	.55	46	11.5
12	.79	48	12.6
14	1.07	54	15.9
16	1.4	60	19.6
18	1.8	66	23.8
20	2.2	72	28.3