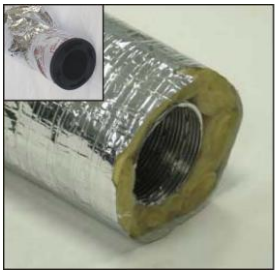
The Unico System®

Aluminum Supply Tubing and Sound Attenuator

Sound Attenuator



Aluminum Supply Tubing

Basic models:

Model	Type	Diameter, in. (mm)
UPC-25	Aluminum supply tubing	2.0 (50.8)
UPC-26	Sound Attenuator	
UPC-225	Aluminum supply tubing	2.5 (63.5)
UPC-226	Sound Attenuator	

GENERAL

The aluminum supply tubing and sound attenuator are insulated flexible air ducts that vary by diameter, length, and insulation thickness. Aluminum supply tubing is provided in 25-ft (7.7 m) lengths and sound attenuator tubing in 12-ft (3.6 m) unless otherwise noted in the model number (see model key below).

SmartDuct combines a 3 ft (0.9 m) length of sound attenuator with a 9 ft (2.7 m) length of aluminum supply tubing. It is a cost-effective option for duct runs between 6 and 12 ft (1.8 and 3.6 m).

APPLICATION

The branch ducts for all small-duct high-velocity (SDHV) systems are some combination of sound attenuator or sound attenuator plus aluminum supply tubing. For proper noise control, every duct must be either Method A – all sound attenuator or SmartDuct – or Method B – a combination of sound attenuator and aluminum supply tubing (see Figs. 1 and 2).

Both the aluminum and sound attenuator tubing can be cut as needed.

Method B is generally more economical and less prone to damage. Method A provides the maximum attenuation when using longer lengths of sound attenuator and avoids the need for aluminum supply tubing; it is recommended for sound critical environments.

For short duct runs under 12 ft (3.6 m), SmartDuct avoids both components separately. For longer duct runs, use method B to minimize leakage should damage occur during installation – the aluminum supply tubing is stronger than the sound attenuator.

BUILDING CODE COMPLIANCE

Use the R-factor required by the local codes.

If not specified:

- For ducts located inside the conditioned building envelope, use our standard insulation thickness (R-3.3).
- For ducts located in unconditioned areas, use the R-6 option.

The aluminum supply tubing, sound attenuator, and SmartDuct are listed per UL-181 and meet the requirements of the national model building and energy codes as described in International Code Council Evaluation report PMG-1002 available online at www.icc-es.org.

Some local codes (such as California Title 24 and Florida) require double vapor barriers for porous ducts (i.e. sound attenuators) in unconditioned spaces. Use R4 with double vapor barrier (revision D), or R6/R8, which only come with double vapor barriers.

Model Key (not all combinations are sold, refer to catalog for available models)

Unico Part Code	Type	Twist-Fit System® Connections	Rev.	SmartDuct®	Length	R-factor	-	Qty
UPC-	(see basic model table)	(blank) = no T = yes (UPC-25/26 only)	(blank) C D	(blank) = no H = yes	(blank) = default xx = xx ft (m)	(blank) = R-3.3 R4 = R-4.2 R6 = R-6.0 R8 = R-8.0	-	Each per box

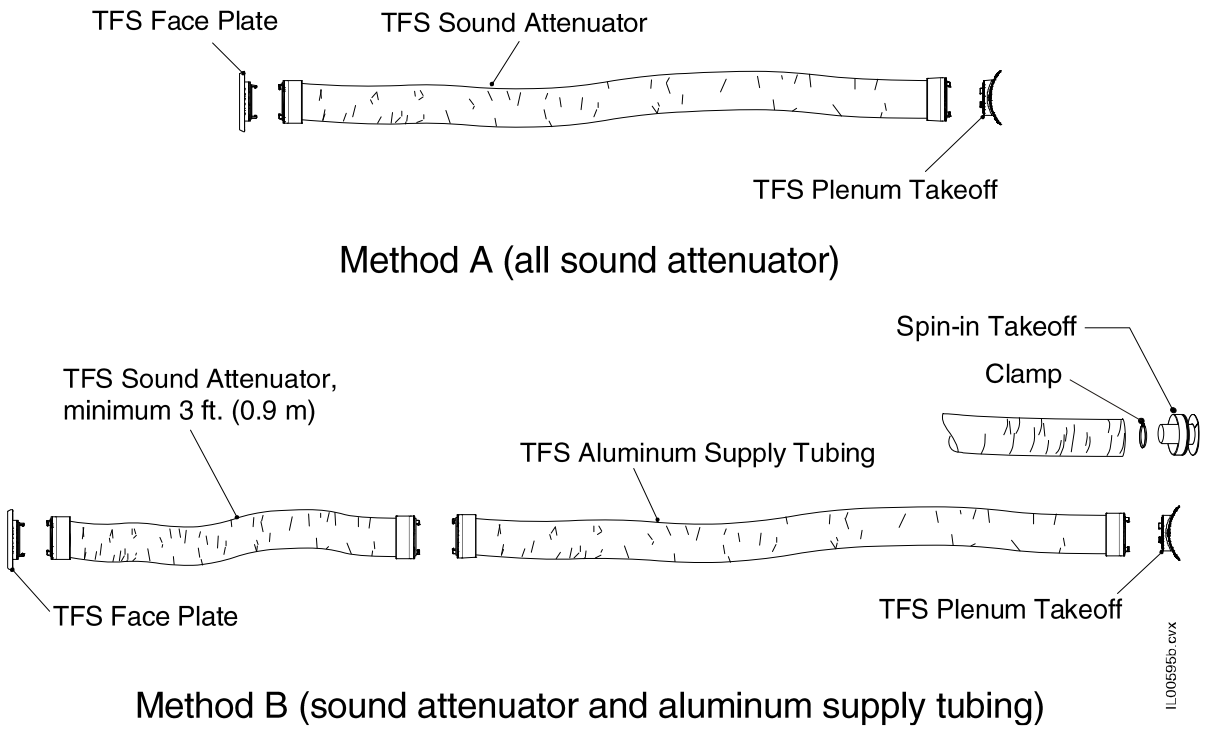


Figure 1. Install method for 2-inch (50 mm) diameter ducts with Twist-Fit System

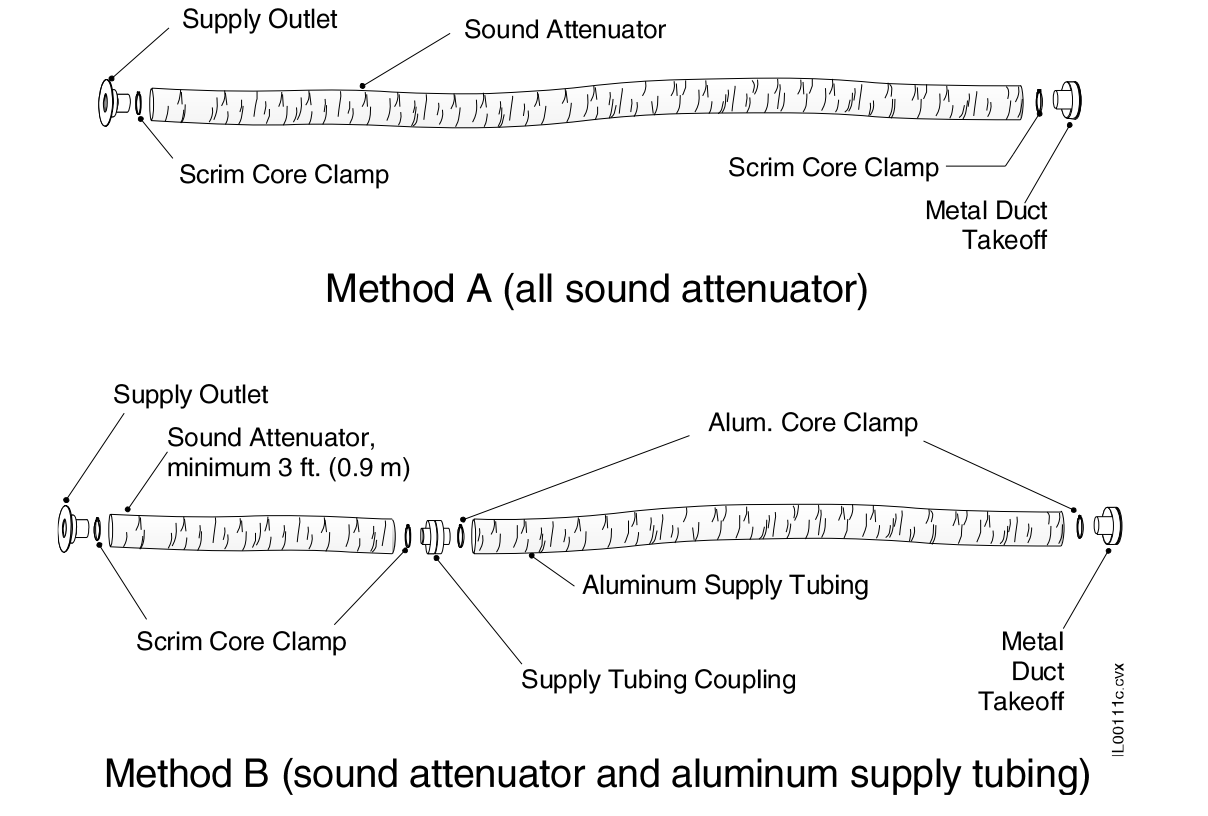


Figure 2. Install method for 2.5-inch (63 mm) diameter ducts

CONSTRUCTION

The ducts are available in four insulation thickness options with corresponding R-factors: R-3.3 (standard), R-4.2, R-6.0 and R-8. All R-3.3 ducts have one vapor barrier; all R6 and R8 ducts have two vapor barriers. The R-4.2 sound attenuator is available with either one or two vapor barriers --single vapor barrier is revision C, double vapor barrier is revision D. The R-4.2 aluminum supply tubing has only a single vapor barrier.

Single vapor barrier ducts are made of 3 components as shown in Figure 3.

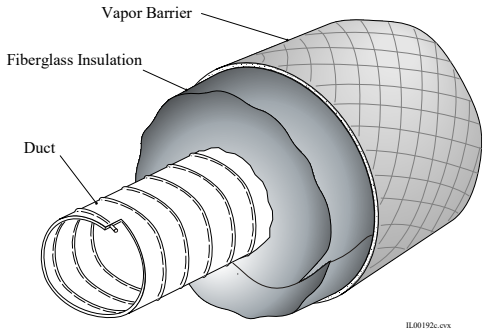


Figure 3. Typical duct construction

The inner core is made of two-ply corrugated aluminum (for supply tubing) or spun-bond nylon (for sound attenuators). The outer jacket is a two-ply, reinforced reflective aluminumized polyester film that provides a vapor seal to prevent air leakage and moisture migration. Fiberglass blanket insulation fills the void between the jacket and core.

Double vapor barrier ducts add an extra insulation layer and an additional vapor barrier (see Figure 4). For sound attenuators this reduces the risk of leakage if the outer vapor barrier is damaged and is required by some local codes (see Compliance section).

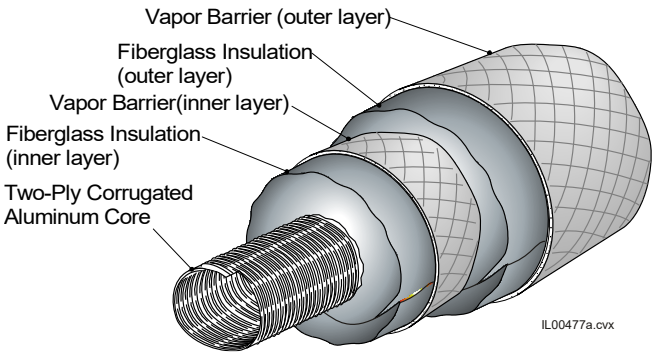


Figure 4. Typical tubing construction with double vapor barrier

TWIST FIT®

The 2-in. (50 mm) diameter models (UPC-25/26) include the Twist Fit system (TFS) couplings. Sound attenuators are supplied with TFS connectors pre-installed on both ends for easy and fast installation. Aluminum supply tubing is supplied with one TFS connector factory-installed and one shipped loose, allowing the tubing to be cut to exact length, or to be more easily pulled through a joist space without snagging.

DUCT HEAT GAIN/LOSS

Whenever a duct is installed in an unconditioned space, heat-gain and heat-loss calculations must include duct losses. These arise from both thermal transfer and air leakage.

Small ducts are factory insulated with gasketed connections, so leakage is extremely low compared with larger ducts — typically under 2 percent, and often too low to measure.

Thermal losses are a combination of conduction and radiation, with conduction being the most important. Conduction heat losses depend on R-factor, insulation thickness and surface area. Because radiant heat transfer is more significant in unconditioned spaces, all Unico ducts use a reflective outer vapor barrier.

The R-factor calculation used in building codes works well for large ducts but can underestimate the benefit of small ducts because it treats the duct wall was flat. Thermal losses should account for duct curvature, which is better captured using effective R-factor (Table 1). As a result, small ducts with lower nominal R-factor can have the same thermal losses comparable to larger ducts with higher R-factor.

The International Residential Code (IRC) and International Energy Conservation Code (IECC) address this by specifying different minimum R-factors for ducts less than 3 in. (76 mm) diameter. For example, small ducts in unconditioned spaces require R-6, whereas large ducts require R-8.

MODEL SPECIFICATIONS

Compliance:	UL Standard 181 Flexible Air Ducts Canadian Standard CAN/ULC-S110 UK Standard BS-476-6 & 7 Australia AS 4254.1 and AS 4859.1
Classification:	Air Duct per UL Standard 181 Air Duct per CAN/ULC-S110
Code Compliance	ICC IMC 2024 ICC-IRC 2024 ICC-IECC 2024 IAPMO UMC 2024 (< 5 ft commercial) CA Title 24 Sub-Chapter 7
Smoke Developed Rating:	less than 50
Flame Spread Index:	less than 25
Inside Diameter:	Model UPC-25/26: 2.0 inch (50 mm) Model UPC-225/226: 2.5 inch (63 mm)
Outside Diameter:	See Tables 1a and 1b
Duct Material (supply tubing):	Two-ply corrugated aluminum
Duct Material (sound attenuator):	Spun Bound Nylon
Sound Attenuator porosity:	5 microns
Insulation:	Fiberglass
Insulation thermal conductivity: per ASTM C518-04	k=0.224 Btu-in/h•ft²•°F (0.032 W/m-K)
Vapor Barrier:	Reinforced Aluminized Polyester film
Min. Pressure:	negative 0.5-inch w.c. (125 Pa)
Max. Pressure:	4.0 inches w.c. (1000 Pa)
Max. Velocity:	5000 ft/min (25 m/s)
Min. Length:	3 ft (1 m) *sound attenuator*
Max Length (recommended):	35 ft (10.7 m)
Max Length (code):	none
Support Distance:	every 6-ft (2 m)
Min. Inside Bend Radius:	6 inch (150 mm)
R-Factor:	See Tables 1a and 1b

NOISE LEVEL

Noise levels are directly related to outlet air velocity. In general, lower velocity yields lower noise; therefore, adding outlets reduces noise level by reducing velocity at each outlet. Use Table 2 as a guide for designing a duct layout that meets your specific sound level requirements.

Table 1a. Duct R-Factor (English units)

Dia.	Insulation	Outside Dia., Inch	R-factor ft²·°F·hr/Btu	
			Rated*	Effective**
2.0 inch (50 mm)	R3	3.5	3.3	4.0
	R4	4.0	4.2	5.8
	R6	5.0	6.0	9.5
	R8	6.0	8.0	13.7
2.5 inch (53 mm)	R3	4.0	3.3	3.9
	R4	4.5	4.2	5.5
	R6	5.5	6.0	9.0
	R8	6.5	8.0	12.9

* Calculated as flat wall per ADC Flexible Duct Standard (approximate)
** Calculated as cylindrical duct per ASHRAE Fundamentals Handbook (accurate)

Table 1b. Duct R-Value (Metric units)

Dia.	Insulation	Outside Dia, mm	R-value m²·K/W	
			Rated*	Effective**
2.0 inch (50 mm)	R3	89	0.58	0.70
	R4	102	0.74	1.02
	R6	127	1.06	1.67
	R8	152	1.41	2.41
2.5 inch (53 mm)	R3	102	0.58	0.68
	R4	114	0.74	0.97
	R6	140	1.06	1.59
	R8	165	1.41	2.27

* Calculated as flat wall per AS 4254.1 (approximate)
** Calculated as cylindrical duct per AS 4859.1 (accurate)

Table 2. Unico System Sound Level Recommendations

Sound Level	**Approx. dB(A)†**	**2-inch (50 mm)**		**2.5-inch (63 mm)**		
		CFM	**Outlet/Ton***	**CFM**	**Outlet/Ton***	**Recommended Application**
Ultra Low	25	14	18	17	14	Multimedia Rooms
Very Low	27	19	13	23	11	Rooms with Hard Surfaces (wood or concrete floors and walls)
Low**	**29**	**30**	**8**	**36**	**7**	**Rooms with Carpet, Drapes, Furniture**
Normal	32	40	6	50	5	Large Rooms or Where Sound is not Critical (min. number of outlets)
Excessive	35	50+	5	60+	4	Industrial Environments

† dB(A) is A-weighted Sound Pressure level measured 3ft (1m) from outlet in a reverberant room 20 x 30 ft.
* Outlets/Ton is based on rated airflow of 250 CFM per nominal cooling ton
** Recommended

NOTE: The actual sound levels measured in a room will vary depending on how the duct was installed (bends, wrinkles, outlet design) and the room environment (carpeted, draperies, etc.). Also, the overall sound in the room depends on the number of outlets in that room.

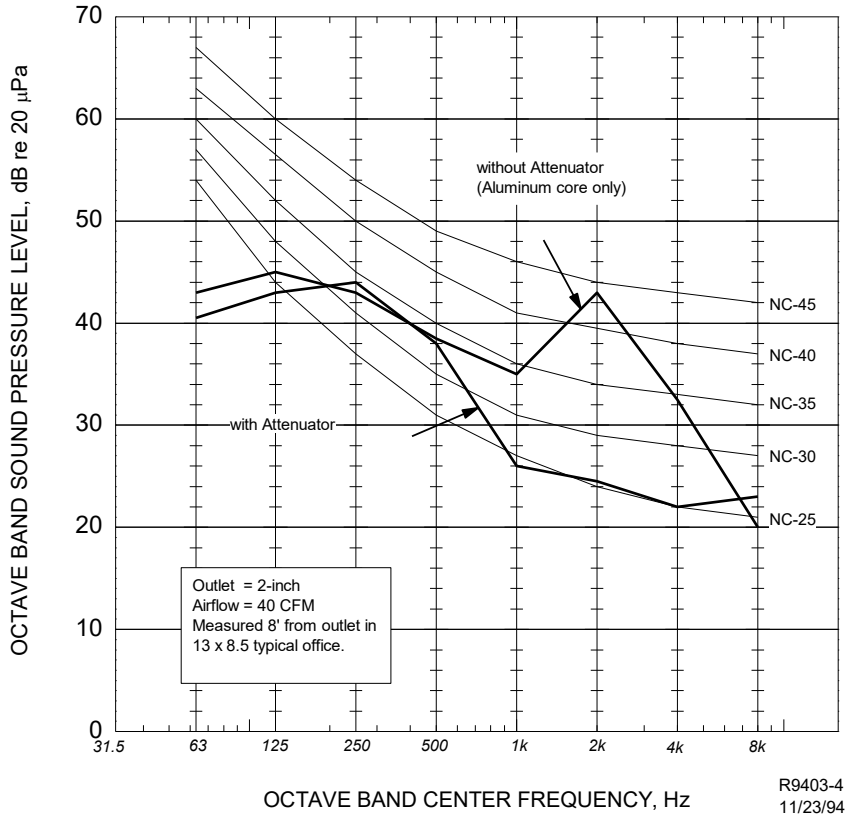


Figure 5. Sound pressure level of aluminum ducting with and without attenuation

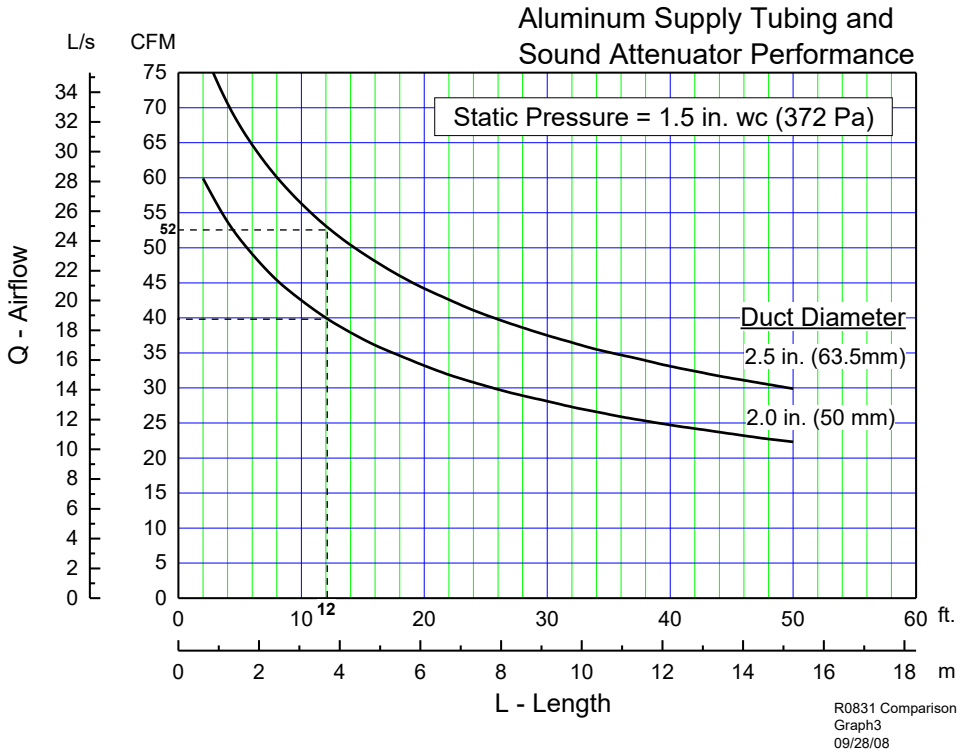


Figure 6. Comparison of airflow along length of 2-inch and 2.5-inch ducts

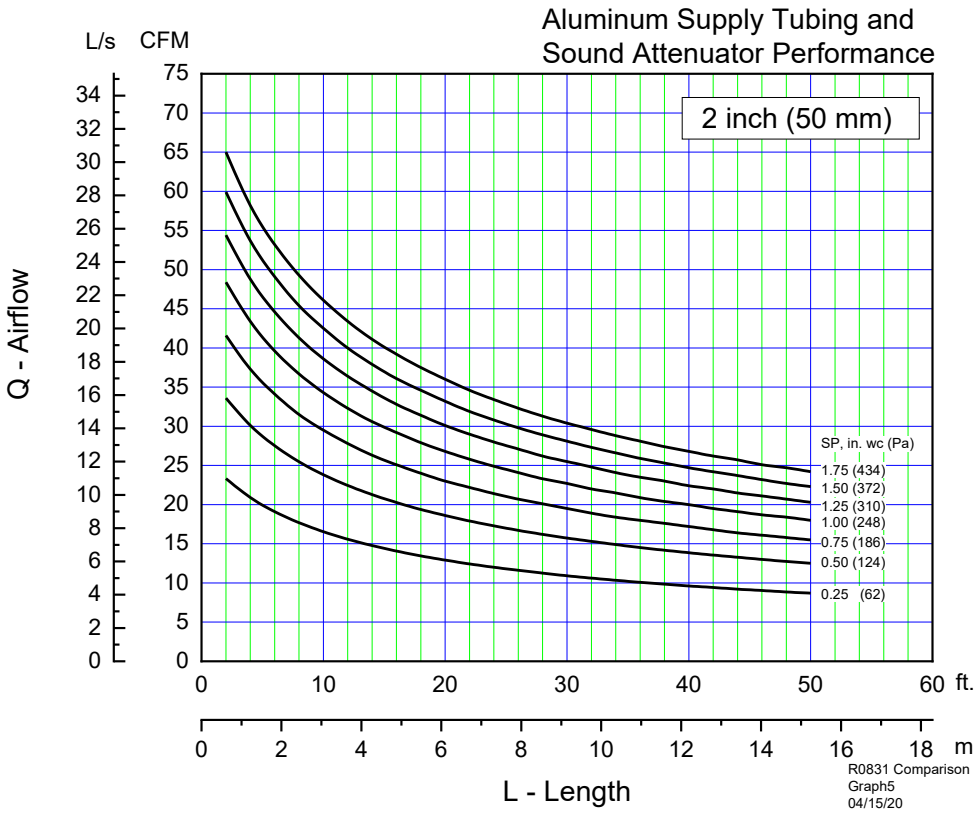


Figure 7. Variation in airflow along length of 2-inch duct at multiple static pressures

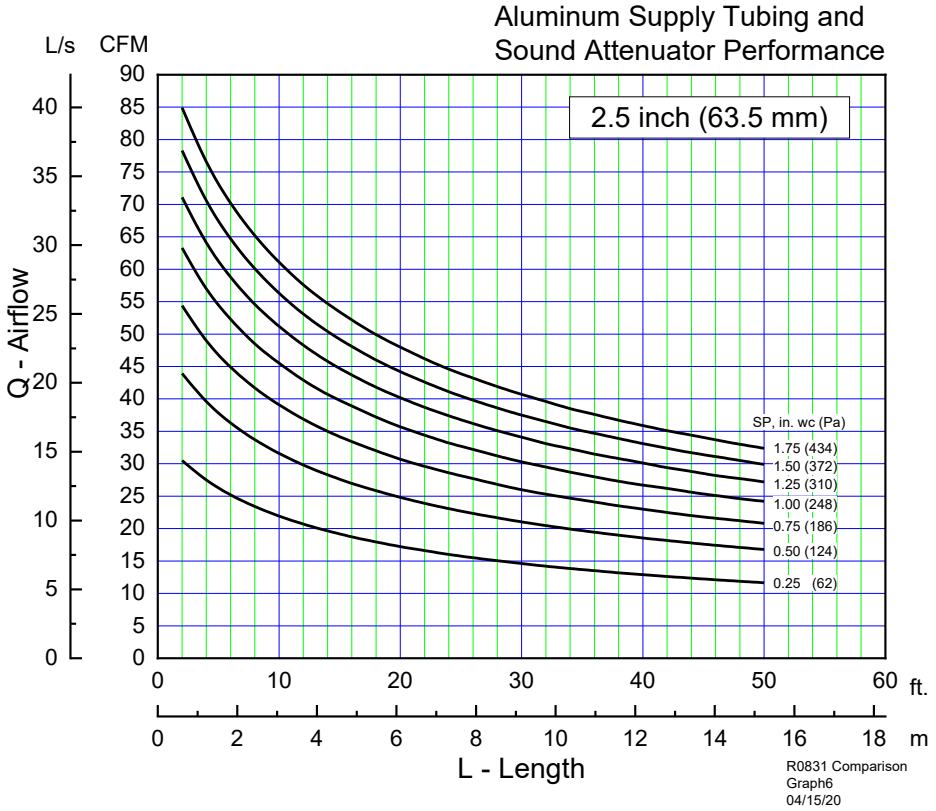


Figure 8. Variation in airflow along length of 2.5-inch duct at multiple static pressures