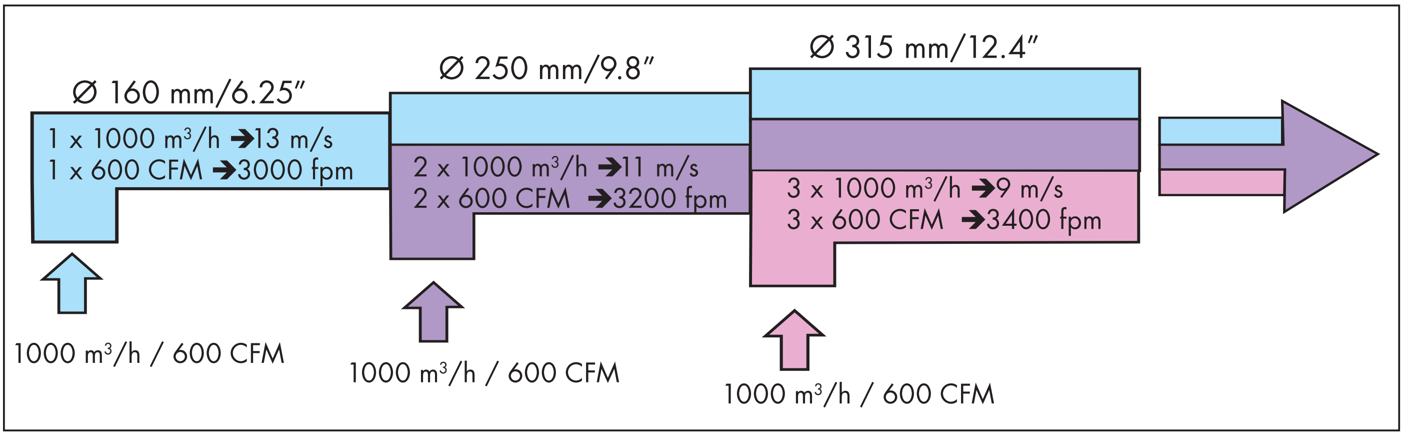
Pressure loss

PLYMOVENT®
VEHICLE EXHAUST REMOVAL SYSTEMS

The importance of minimising pressure loss in your duct system

Pressure loss is the No. 1 enemy in a ventilation system. It's no use buying the world's best exhaust extractor system if the pressure in your duct work is too high. To help you understand pressure loss and how to minimise the effects of it in your system, these two pages show in simple form how you can calculate it.



What is pressure loss?

The air resistance in a duct work system is mainly determined by the velocity of the air in that system. As the velocity increases, so does the resistance. This is, what we call pressure loss. The "static pressure" in a fan indicates the volume of air that the fan can extract, given a certain pressure loss. The higher the pressure loss, the less air the fan will extract.

The diagram above demonstrates how the pressure loss (resistance) can be kept down by increasing the size of the ducts, to make you achieve an even velocity in the entire system. When extracting diesel exhaust fumes you must maintain a relatively high velocity to avoid the soot particles settling in the duct system. A velocity of 10-15 m/s / 2000-3000 FPM is considered reasonable. A too high velocity may create noise disturbance in the Fire station.

Pressure loss calculation

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Pressure is measured in Pascal (Pa) / inch water gauge (wg). To calculate how many Pa / inch wg you get in a certain duct, you must know how much air passes through the duct. Air volume is measured in m^3/h / CFM. Next, you will find a pressure loss table and an example of the calculation.

Recommended values:

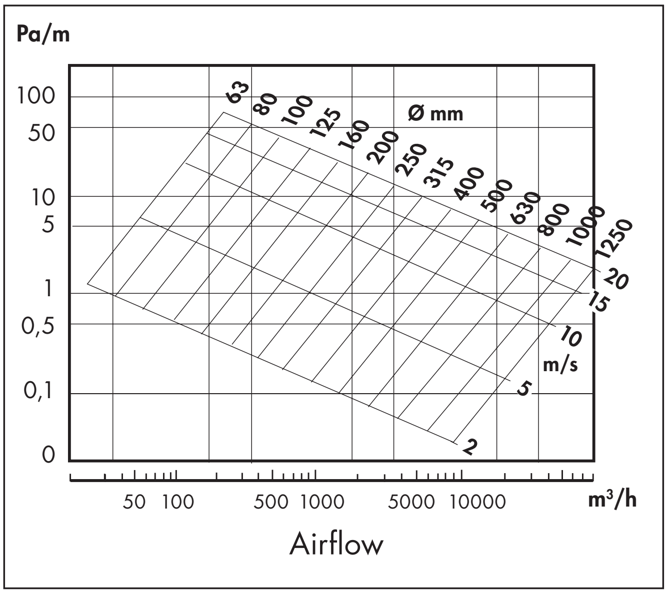
Air velocity in ducting: 10-15 m/s /2000-3000 FPM

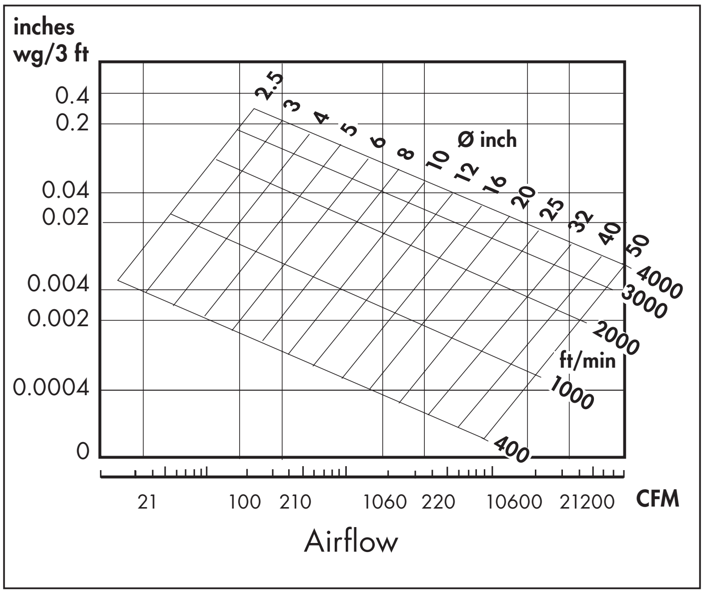
Air volume per Fire Apparatus: 1000 m^3/h /600 CFM

Suggestion!

In larger systems, it is usually a good idea to position the fan in the middle of the system. This gives several advantages – one is a lower pressure loss, another is that you can use smaller dimensioned duct work.

Pressure loss in ducting





Duct diam. in mm	1000 m³/h		2000 m³/h		3000 m³/h		4000 m³/h		5000 m³/h		6000 m³/h		7000 m³/h		8000 m³/h		9000 m³/h		10000 m³/h	
	Pa	m/s	Pa	m/s	Pa	m/s	Pa	m/s	Pa	m/s	Pa	m/s	Pa	m/s	Pa	m/s	Pa	m/s	Pa	m/s
Ø160	18	13	60	26																
Ø200	5	9	20	18	45	26	75	35												
Ø250	2	5.5	6	11	14	18	22	22	40	28	50	34	70	39						
Ø315			2	6.5	3	9	6	13	9	16	11	19	17	22	22	26	27	28	32	32
Ø400					1	7	2	9	3	11	5	12	6	15	8	17	10	18	12	22
Ø500							1	6	1	7	2	8	2	10	3	11	3	13	4	14

Table shows pressure loss in Pa and air velocity in m/s at different air volumes (m^3/h) and different ducting dimensions in mm.

Duct diam. in inches	600 CFM		1200 CFM		1800 CFM		2400 CFM		3000 CFM		3600 CFM		4200 CFM		4800 CFM		5400 CFM		6000 CFM	
	In wg	fpm	In wg	fpm	In wg	fpm	In wg	fpm	In wg	fpm	In wg	fpm	In wg	fpm	In wg	fpm	In wg	fpm	In wg	fpm
Ø6″	.024	3000	.094	6000																
Ø8″	.006	1700	.022	3400	.047	5100														
Ø10″			.007	2200	.015	3300	.028	4400	.040	5500	.058	6600								
Ø12″					.006	2300	.011	3100	.016	3800	.023	4600	.031	5400	.038	6100	.050	6800		
Ø14″					.003	1700	.005	2350	.007	2800	.011	3400	.014	3900	.018	4500	.023	5000	.014	4300
Ø16″					.002	1300	.002	1700	.004	2150	.005	2600	.007	3000	.009	3450	.012	3900	.005	2750
Ø20″											.002	1650	.002	1900	.003	2200	.004	2400		

Table shows pressure loss in inches wg and air velocity in fpm at different air volumes (CFM) and different ducting dimensions in inches.