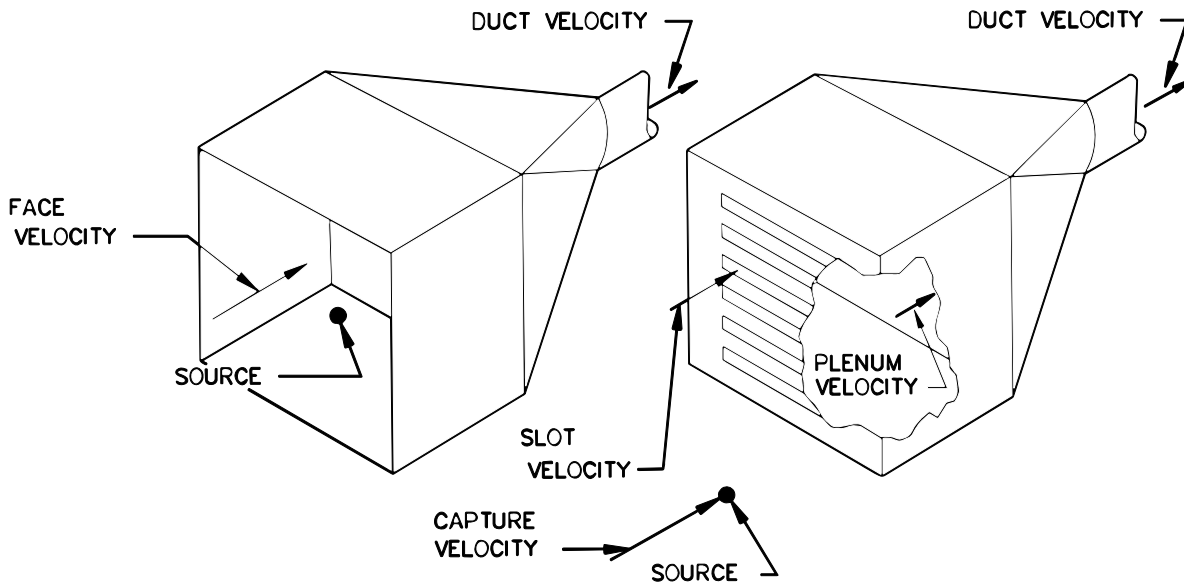


FIGURE 9-1. Example portion of system



CAPTURE VELOCITY- AIR VELOCITY AT ANY POINT IN FRONT OF THE HOOD OR AT THE HOOD OPENING NECESSARY TO OVERCOME OPPOSING AIR CURRENTS AND TO CAPTURE THE CONTAMINATED AIR AT THAT POINT BY CAUSING IT TO FLOW INTO THE HOOD.

FACE VELOCITY- AIR VELOCITY AT THE HOOD OPENING.

SLOT VELOCITY- AIR VELOCITY THROUGH THE OPENINGS IN A SLOT-TYPE HOOD. IT IS USED PRIMARILY AS A MEANS OF OBTAINING UNIFORM AIR DISTRIBUTION ACROSS THE FACE OF THE HOOD.

PLENUM VELOCITY- AIR VELOCITY IN THE PLENUM. FOR GOOD AIR DISTRIBUTION WITH SLOT-TYPES OF HOODS, THE MAXIMUM PLENUM VELOCITY SHOULD BE 1/2 OF THE SLOT VELOCITY OR LESS.

DUCT VELOCITY- AIR VELOCITY THROUGH THE DUCT CROSS SECTION. WHEN SOLID MATERIAL IS PRESENT IN THE AIR STREAM, THE DUCT VELOCITY MUST BE EQUAL TO OR GREATER THAN THE MINIMUM AIR VELOCITY REQUIRED TO MOVE THE PARTICLES IN THE AIR STREAM.

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*HOOD NOMENCLATURE
LOCAL EXHAUST*

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FIGURE 3-1

Capture Velocities

TABLE 3-1. Range of Capture Velocities^{1,2,3}

Condition of Dispersion of Contaminant	Example	Capture Velocity, fpm
Released with practically no velocity into quiet air.	Evaporation from tanks; degreasing, etc.	50-100
Released at low velocity into moderately still air.	Spray booths; intermittent container filling; low speed conveyor transfers; welding; plating; pickling	100-200
Active generation into zone of rapid air motion.	Spray painting in shallow booths; barrel filling; conveyor loading; crushers	200-500
Released at high initial velocity into zone at very rapid air motion.	Grinding; abrasive blasting; tumbling	500-2000

In each category above, a range of capture velocity is shown. The proper choice of values depends on several factors:

Lower End of Range

1. Room air currents minimal or favorable to capture.
2. Contaminants of low toxicity or of nuisance value only.
3. Intermittent, low production.
4. Large hood-large air mass in motion.

Upper End of Range

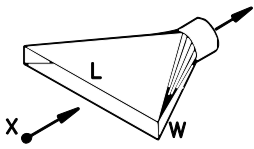
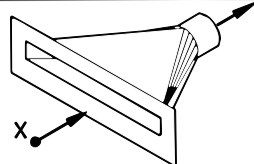
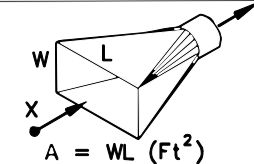
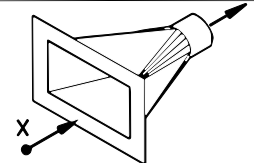
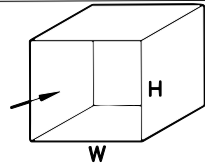
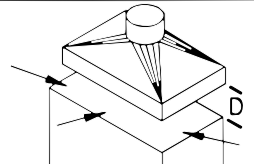
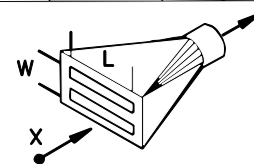
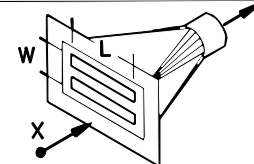
1. Disturbing room air currents.
2. Contaminants of high toxicity.
3. High production, heavy use.
4. Small hood-local control only.

Minimum Duct Design Velocities

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TABLE 3-2. Range of Minimum Duct Design Velocities

Nature of Contaminant	Examples	Design Velocity
Vapors, gases, smoke	All vapors, gases and smoke	Any desired velocity (economic optimum velocity usually 1000-2000 fpm)
Fumes	Welding	2000-2500
Very fine light dust	Cotton lint, wood flour, litho powder	2500-3000
Dry dusts & powders	Fine rubber dust, Bakelite molding powder dust, jute lint, cotton dust, shavings (light), soap dust, leather shavings	3000-4000
Average industrial dust	Grinding dust, buffing lint (dry), wool jute dust (shaker waste), coffee beans, shoe dust, granite dust, silica flour, general material handling, brick cutting, clay dust, foundry (general), limestone dust, packaging and weighing asbestos dust in textile industries	3500-4000
Heavy dusts	Sawdust (heavy and wet), metal turnings, foundry tumbling barrels and shake-out, sand blast dust, wood blocks, hog waste, brass turnings, cast iron boring dust, lead dust	4000-4500
Heavy or moist	Lead dusts with small chips, moist cement dust, asbestos chunks from transite pipe cutting machines, buffing lint (sticky), quick-lime dust	4500 and up

HOOD TYPE	DESCRIPTION	ASPECT RATIO, W/L	AIR FLOW
	SLOT	0.2 OR LESS	$Q = 3.7 LVX$
	FLANGED SLOT	0.2 OR LESS	$Q = 2.6 LVX$
	PLAIN OPENING	0.2 OR GREATER AND ROUND	$Q = V(10X^2 + A)$
	FLANGED OPENING	0.2 OR GREATER AND ROUND	$Q = 0.75V(10X^2 + A)$
	BOOTH	TO SUIT WORK	$Q = VA = VWH$
	CANOPY	TO SUIT WORK	$Q = 1.4 PVD$ SEE FIG. VS-99-03 P = PERIMETER D = HEIGHT ABOVE WORK
	PLAIN MULTIPLE SLOT OPENING 2 OR MORE SLOTS	0.2 OR GREATER	$Q = V(10X^2 + A)$
	FLANGED MULTIPLE SLOT OPENING 2 OR MORE SLOTS	0.2 OR GREATER	$Q = 0.75V(10X^2 + A)$

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HOOD TYPES

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FIGURE 3-11

Standard Duct Sizes

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TABLE 5-8. Area and Circumference of Circles

Diam. In Inches	AREA		CIRCUMFERENCE		Diam. In Inches	AREA		CIRCUMFERENCE	
	Square Inches	Square Feet	Inches	Feet		Square Inches	Square Feet	Inches	Feet
1	0.79	0.0055	3.14	0.2618	30	706.9	4.909	94.2	7.854
1.5	1.77	0.0123	4.71	0.3927	31	754.8	5.241	97.4	8.116
2	3.14	0.0218	6.28	0.5236	32	804.2	5.585	100.5	8.378
2.5	4.91	0.0341	7.85	0.6545	33	855.3	5.940	103.7	8.639
3	7.07	0.0491	9.42	0.7854	34	907.9	6.305	106.8	8.901
3.5	9.62	0.0668	11.00	0.9163	35	962.1	6.681	110.0	9.163
4	12.57	0.0873	12.57	1.0472	36	1017.9	7.069	113.1	9.425
4.5	15.90	0.1104	14.14	1.1781	37	1075.2	7.467	116.2	9.687
5	19.63	0.1364	15.71	1.3090	38	1134.1	7.876	119.4	9.948
5.5	23.76	0.1650	17.28	1.4399	39	1194.6	8.296	122.5	10.210
6	28.27	0.1963	18.85	1.5708	40	1256.6	8.727	125.7	10.472
6.5	33.18	0.2304	20.42	1.7017	41	1320.3	9.168	128.8	10.734
7	38.48	0.2673	21.99	1.8326	42	1385.4	9.621	131.9	10.996
7.5	44.18	0.3068	23.56	1.9635	43	1452.2	10.085	135.1	11.257
8	50.27	0.3491	25.13	2.0944	44	1520.5	10.559	138.2	11.519
8.5	56.75	0.3941	26.70	2.2253	45	1590.4	11.045	141.4	11.781
9	63.62	0.4418	28.27	2.3562	46	1661.9	11.541	144.5	12.043
9.5	70.80	0.4922	29.85	2.4871	47	1734.9	12.048	147.7	12.305
10	78.54	0.5454	31.42	2.6180	48	1809.6	12.566	150.8	12.566
10.5	86.59	0.6013	32.99	2.7489	49	1885.7	13.095	153.9	12.828
11	95.03	0.6600	34.56	2.8798	50	1963.5	13.635	157.1	13.090
11.5	103.87	0.7213	36.13	3.0107	52	2123.7	14.748	163.4	13.614
12	113.10	0.7854	37.70	3.1416	54	2290.2	15.904	169.6	14.137
13	132.73	0.9218	40.84	3.4034	56	2463.0	17.104	175.9	14.661
14	153.94	1.0690	43.98	3.6652	58	2642.1	18.348	182.2	15.184
15	176.71	1.2272	47.12	3.9270	60	2827.4	19.635	188.5	15.708
16	201.06	1.3963	50.27	4.1888	62	3019.1	20.966	194.8	16.232
17	226.98	1.5763	53.41	4.4506	64	3217.0	22.340	201.1	16.755
18	254.47	1.7671	56.55	4.7124	66	3421.2	23.758	207.3	17.279
19	283.53	1.9689	59.69	4.9742	68	3631.7	25.220	213.6	17.802
20	314.16	2.1817	62.83	5.2360	70	3848.5	26.725	219.9	18.326
21	346.36	2.4053	65.97	5.4978	72	4071.5	28.274	226.2	18.850
22	380.13	2.6398	69.12	5.7596	74	4300.8	29.867	232.5	19.373
23	415.48	2.8852	72.26	6.0214	76	4536.5	31.503	238.8	19.897
24	452.39	3.1416	75.40	6.2832	78	4778.4	33.183	245.0	20.420
25	490.87	3.4088	78.54	6.5450	80	5026.5	34.907	251.3	20.944
26	530.93	3.6870	81.68	6.8068	82	5281.0	36.674	257.6	21.468
27	572.56	3.9761	84.82	7.0686	84	5541.8	38.485	263.9	21.991
28	615.75	4.2761	87.96	7.3304	86	5808.8	40.339	270.2	22.515
29	660.52	4.5869	91.11	7.5922	88	6082.1	42.237	276.5	23.038

The usual sheet metal fabricator will have patterns for ducts in 0.5-inch steps through 5.5-inch diameter; 1 inch steps 6 inches through 20 inches and 2-inch steps 22 inches and larger diameters.