

TABLE 29-B
MINIMUM CONTROL VELOCITIES

(Minimum Air Velocities Recommended for the Capture of Dusts, Fumes, Smokes, Mists, Gases, and Vapors Released at Various Types of Operations)

Conditions of Generation, Dispersion, or Release of Contaminant	Minimum Control Velocity (fpm)	Examples of Processes or Operations
Released with no significant velocity into relatively quiet air	100	Evaporation or escape of vapors, gases, or fumes from open vessels, degreasing, pickling, plating
Released with low initial velocity into moderately quiet air	100-200	Spray paint booths, cabinets, and rooms, intermittent dumping of dry materials into containers, welding
Released with considerable velocity or into zone of rapid air movement	200-500	Some spray painting in small booths and with high pressure, active barrel or container filling, conveyor loading
Released with high velocity or into zone of very rapid air movement	500-2,000	Grinding, abrasive blasting, surfacing operations on rock

From Allen D. Brandt "A Summary of Design Data for Exhaust Systems" Heating and Ventilating (May 1945)

For circular or square openings, b is essentially 0.1 and the equation becomes

$$v = \frac{0.1 Q}{x^2 + 0.1 A} \quad (2)$$

Suppose the duct is 6 in. in diameter, and the velocity of air in it is 4000 fpm—a common situation in dust exhaust systems. Since a 6-in. diameter circle is 0.196 sq ft in area of cross section, $Q = 0.196 \times 4000$ or 780 cfm (In ducts, $Q = Av_{\text{DUCT}}$)

Two inches out from the duct end, v has fallen from 4000 fpm to 1650. At 4 in. from the duct, the velocity is 600, at 6 in. away, it is only 290 fpm—barely enough to be felt by the hand.

Where x is very large compared with A , equation (2) becomes

$$v = \frac{Q}{10x^2} \quad (3)$$

See Table 29-A

Flanged hood. If a flange is placed around the duct opening, as shown in Fig. 29-1

(right), it will reduce entrance or turbulence loss by keeping the hood from drawing air from in back of the hood face. For the same total amount of air exhausted, a larger portion will come from in front of the duct. This is beneficial, since air that moves from the back side of the hood does not help control the contaminant out in front. A flange will increase the useful air by 20 to 30 per cent, for the same total volume of air handled. The flange width can equal the hood diameter or side, but generally need not exceed 6 in.

Face velocity vs. mass air movement. The preceding equations also show that the capture velocity, v , depends on total air flow entering the hood. This is frequently overlooked. A high *face velocity* or, in the case of a slot-shaped hood, a high slot velocity is not the important factor. The capture of air contaminants depends on mass air movement, Q , not on mere face velocity.

Regardless of face velocity, a source of suction has a woefully poor ability to "reach out" in a certain direction and induce an inflowing stream of air even a few inches from the usual hood face. Yet, not infrequently,