TABLE 28-C

RECOMMENDED MINIMUM DUCT VELOCITIES

Nature of Contaminant	Examples	Duct Velocity (fpm)
Vapors, gases, smokes, fumes, and very light dusts	All vapors, gases, and smokes, zinc and aluminum oxide fumes, wood flour and cotton lint	2,000
Medium density dry dusts	Cotton, buffing and jute lint, wood, grain, rubber, and bakelite dust	3,000
Average industrial dust	Wool, wood, sand blast, grinding, and shoe dust, wood shavings, foundry dust	4,000
Heavy dusts	Lead, and heavy foundry dusts, metal turnings, jute butts	5,000
Large particles, of heavy moist materials	Moist lead and other heavy dusts	5,000 and over

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

example, a 10-in branch leading to a hood only 12 ft from the fan will short-circuit a second branch 4 in in diameter coming from a hood 25 ft away—if the system is not balanced This, of course, is because the friction loss in a long length of small-diameter pipe is far greater than the loss in a short length of large pipe. Friction loss (which in turn causes pressure drop) is far more important in air systems than it is, for instance, in water piping

Whether a system operates under positive (blowing) or negative (suction) pressure makes no difference so far as duct design features are concerned Usually, however, exhaust systems have high air velocities to keep dust in suspension in the duct Positive pressure systems, those that supply ventilating air to a given space, operate with relatively low duct velocities. Table 28-C shows recommended minimum duct velocities for handling different types of contaminants Energy losses occur in ducts in the following ways

Velocity pressure A definite negative pressure or suction must be created by the fan to get air moving at a certain velocity. This suction, known as velocity pressure or velocity head, depends on the square of the velocity:

$$VP = \left(\frac{V}{4{,}005}\right)^2$$

where VP = velocity pressure in inches, water gauge

V = velocity in fpm

High velocity systems, such as are needed to convey dusts, are more expensive to operate than low velocity systems Table 28-D shows examples of how much negative pressure an exhaust fan must create to get air to move at the given velocities.

Air horsepower depends directly on pressure and rate of air flow, as follows

$$\text{Air horsepower} = \frac{P \times Q}{6{,}356}$$

where P = pressure in inches of water

Q = air flow in cfm

Therefore, the horsepower to make 1,000 cfm move at a velocity of 5,000 fpm, for example, would be *six* times the horsepower needed to make it move at 2,000 fpm.

Hood entrance loss This is determined by the shape of the hood, varying from a bell-shaped entrance with negligible loss (rare), to an abrupt open-end pipe where the loss is 0.93 VP (undesirable). An additional reason for putting flanges on, besides their