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Chapter 32

AIR DUCT DESIGN

Pressure Losses, Friction Losses, Friction Loss Chart, Elbow Friction Losses, Proportioning the Losses, Duct Sizes, Procedure for Duct Design, Velocities, Main Trunk Ducts, Proportioning the Size for Friction, Velocity Method, Equal Friction Method, Duct Construction Details

THE resistance of an air handling system can be computed from the methods and data given in this chapter. The actual resistance for any given installation, however, may vary considerably from the calculated resistance because of variation in the smoothness of materials, the type of joints used and the ability of the mechanics to fabricate in accordance with the design. It is best to select fans and motors of sufficient size to allow a factor of safety. Volume dampers should be installed in each branch outlet to balance the system. It is improbable that the required quantities of air will be delivered at each outlet without adjustment of the dampers, which usually results in a total pressure exceeding that of the design, unless a liberal factor of safety is allowed.

The flow of air due to large pressure differences is most accurately stated by thermodynamic formulae for air discharge under conditions of adiabatic flow, but such formulae are complicated, and the error occasioned by the assumption that the gas density remains constant throughout the flow may be considered negligible when only such pressure differences are involved as occur in ordinary heating and ventilating practice.

In the development of the formulae, diagrams, and tables for the flow of air, use is made of the following basic equation for the flow of fluids:

If H_v be the velocity head in feet of a fluid, and the velocity, V , be expressed in feet per minute, the fundamental equation is

$$V = 60 \sqrt{2g H_v}$$

The factor g is the acceleration due to gravity, or 32.16 ft per second per second.

It is usual to express the head in inches of water for ventilating work and, since the heads are inversely proportional to the densities of the fluids,

$$\frac{H_v}{h_v} = \frac{62.4}{d}$$

or

$$H_v = 5.2 \frac{h_v}{d}$$