

on the driving motor, or fan, may be changed to vary the speed of the fan thus altering the air volume. Dampers may be placed in the duct system to vary the volume. Variable speed pulleys or transmissions, such as fan belt change boxes or hydraulic couplings, may be used to vary the fan speed. Variable speed motors and variable fan inlet vanes may also be used to adjust the fan volume. All of these methods will give control. From a power consumption standpoint, a reduction of the fan speed is most efficient. Inlet vanes save some power and dampers save the least. From the standpoint of first cost, dampers usually are the lowest in cost. In some installations adjustments of volume are desirable at various times during the day or continuously. In others an increased supply of air in summer over that needed in winter is demanded. The demands of each case will dictate which type of control is most desirable. Where noise is a factor, lowering the fan speed if possible is preferred as a control means, because of the resulting reduction in sound level.

MOTIVE POWER

Heating and ventilating fans are usually driven by electric motors, although they may be driven by gasoline or oil engines, steam engines or turbines. Fans may be direct-connected to the operating unit, but it is the usual practice to use belt driven fans for large units.

In selecting the size motor to be used, it is general practice to provide a rather liberal allowance over the actual fan power required when fan has a rising horsepower characteristic. Actual static pressures may vary from those estimated and if less than estimated, the fan may deliver more air than required and take more power. Justification for liberal power provision exists also in the possibility of varying demand, due to change in ventilation requirement, intensity of occupation and weather conditions. The degree of allowance may vary with fan types due to their inherent characteristics. The backward curved blade type fan requires maximum power at or near the peak of the efficiency, hence this fan would require less allowance in driving power than other types not having this characteristic. Reference to Fig. 5 indicates that there is no justification for allowing large spare motor capacity, and it is generally more economical to operate motors well loaded.

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Chapter 31

AIR DISTRIBUTION

Definitions, Grille Locations, Standards for Satisfactory Conditions, Factors Affecting Distribution for Cooling and Heating, Air Outlet Noises, Selection of Supply Outlets, Balancing System

CORRECT air distribution contributes as much or more to the success of a forced air heating, ventilating, cooling or air conditioning system as does any other single factor. Supplying the proper amount of air is one problem; properly distributing it from the point where it leaves the fan is another. The distribution problem may be further divided into: (a) distribution to the various spaces served by the system, (b) distribution in these spaces. This discussion is primarily limited to division (b), reference being made to the duct system only insofar as it affects the performance of the air distribution outlets.

Definitions

1. *Supply Opening or Outlet*: Any opening through which air is delivered into a space which is being heated, or cooled, or humidified, or dehumidified, or ventilated.
2. *Exhaust Opening*: Any opening through which air is removed from a space which is being heated, or cooled, or humidified, or dehumidified, or ventilated.
3. *Outside Air Opening*: Any opening used as an entry for air from outdoors.
4. *Grille*: A covering for any opening and through which air passes.
5. *Damper*: A device used to vary the volume of air passing through a confined cross-section by varying the cross-sectional area.
6. *Multiple Louver Damper*: A damper having a number of adjustable blades.
7. *Single Louver Damper*: A damper having one adjustable blade.
8. *Face*: A grille with provision for attaching a damper.
9. *Register*: A face with a damper attached.
10. *Flange*: The portion (either integral or separate) of a grille, face, or register extending into the duct opening for the purpose of mounting.
11. *Frame*: The portion (either integral or separate) of a grille, face, or register extending around the duct opening for the purpose of mounting.
12. *Margin*: The margin of a grille, face, or register is one-half of the difference between the duct dimension and overall dimension measured either horizontally or vertically.
13. *Fret*: The member separating the openings of a grille, face, or register.
14. *Free Area*: The total minimum area of the openings in the grille, face, or register through which air can pass.
15. *Core Area*: The total plane area of the portion of a grille, face, or register bounded by a line tangent to the outer edges of the outer openings through which air can pass.
16. *Mean Area*: The total of the core and free areas divided by two.
17. *Duct Area*: The area of a cross-section of the duct based on the inside dimensions at the point where the grille, face or register is mounted.
18. *Percentage Free Area*: The ratio of the free area to the core area expressed in percentage.