

2. The use of awnings at all windows in east, south, and west exposures may result in savings of from 20 to 30 per cent in the required cooling load.

3. The cooling load per degree difference in temperature is not constant but increases as the outdoor temperature increases.

4. The heat lag of the building complicates the estimation of the cooling load under any specified conditions and makes such estimates, based on the usual methods of computation, of doubtful value.

5. The seasonal cooling requirements are extremely variable from year to year, and the ratio between the degree-hours of any two seasons occurring within a 10-year period may be as high as 7.5 to 1. Hence an average value of the degree-hours cooling per season is comparatively meaningless.

6. The results of the tests suggest the use of a fan at night either to provide more comfortable conditions during the following day without provision for cooling, or to reduce the load required for cooling during the following day. Experience has shown that the volume of air required for cooling, depending upon the climate and the construction of the building, must usually be from 50 to 100 per cent greater than that required for heating. If the size of the fan is based upon the summer requirement, its output may be reduced sufficiently to meet winter heating needs.

7. Attic exhaust fans are becoming popular adjuncts for night duty. (See Chapter 12.)

DUCT DESIGN

The ducts may be either round or rectangular. Rectangular ducts should be as nearly square as possible; the width should not be greater than four times the breadth. The radii of elbows should be not less than one and one-half times the pipe diameter for round pipes, or the equivalent round pipe size in the case of rectangular ducts.

The ducts or piping may be designed either as a trunk line system or as a system of individual ducts from the furnace casing to each register. The engineering problems incident to the design of a trunk line system are somewhat more difficult than for the individual duct system. The trunk line system is generally a tailor-made job, whereas the individual duct system with which either round or square ducts may be used may frequently be assembled from stock materials and thus installed at a considerable saving. Individual ducts may frequently be grouped to simulate a trunk duct system in appearance. The design of ducts for air flow is described in Chapter 20.

Dampers

Suitable dampers are essential to any trunk or individual duct system, as it is virtually impossible to so lay out a system that it will be absolutely in balance without the use of dampers. Special care must be used in the design of any system to avoid turbulence and to minimize resistance. Sharp elbows, angles, and offsets should be avoided. See Figs. 1 and 2, Chapter 20.

Three types of dampers are commonly used in trunk and individual duct systems. *Volume dampers* are used to completely cut off or reduce the flow through pipes. (See A and B, Fig. 4.) *Splitter dampers* are used where a branch is taken off from a main trunk. (See C, Fig. 4.) *Squeeze dampers* are used for adjusting the volume of air flow and resistance through a given duct. (See D, Fig. 4.) It is essential that a damper be provided for each main or duct branch. A positive locking device should be used with each type of damper.

Supply and Return Air Registers

Supply registers located in the floor are effective, but as they require frequent attention to keep them clean they should be avoided where another effective register location can be found. Unless registers located in the baseboard are well proportioned and designed to harmonize with

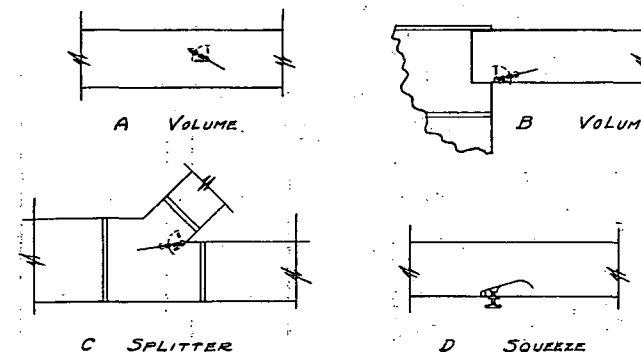


FIG. 4. THREE TYPES OF DAMPERS COMMONLY USED FOR TRUNK AND INDIVIDUAL DUCT SYSTEMS

the trim, they may be unsightly. Registers which are located in side walls above the baseboard or in the ceiling should be of an effective air-diffusing type. All registers should be sealed against leakage around the borders or margins.

Velocities through registers may be reduced by the use of registers larger than the connecting pipes. Some suggestions for equalizing velocities over the face area of the register by means of diffusers are illustrated

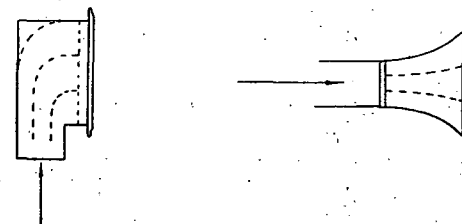


FIG. 5. DIFFUSERS IN TRANSITION FITTINGS TO EQUALIZE VELOCITIES THROUGH REGISTER FACES

in Fig. 5. Merely to use a larger register may not result in materially reduced velocities unless such diffusers are used.

Care should be exercised in making the connection between the supply register and its box to prevent streaking of the wall. All warm air registers should be equipped with dampers or, better, with diffuser dampers which may be used to direct air currents in such a way that they will not be objectionable. (See Chapter 19.)