

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.

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

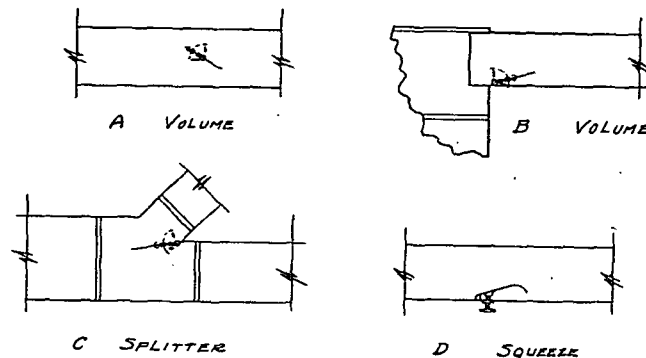


FIG. 4. THREE TYPES OF DAMPERS COMMONLY USED FOR TRUNK AND INDIVIDUAL DUCT SYSTEMS

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 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 19.

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 19.

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 may be located either in the floor, in a side wall at the baseboard, in a side wall at some point higher than the baseboard, or in the ceiling.

Velocities through registers may be reduced by the use of registers

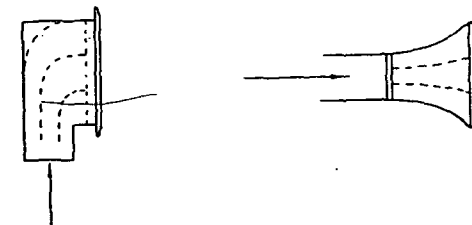


FIG. 5. DIFFUSERS IN TRANSITION FITTINGS TO EQUALIZE VELOCITIES THROUGH REGISTER FACES

larger than the connecting pipes. Some suggestions for equalizing velocities over the face area of the register by means of diffusers are illustrated 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 20).

CONTROLS

Air stratification, high bonnet temperatures, excessive flue gas temperatures, and heat overrun or lag in the system can be largely eliminated through proper care in the planning and installation of the control system. The essential requirements of the control are:

1. To keep the fire burning regardless of the weather.
2. To avoid excessive bonnet temperatures with resultant radiant heat losses into the basement.