

velocity, and location of the supply outlet affect the room conditions much more than the changes in the location of the return grilles. Three methods of locating outlets and grilles are in common use. One method is to locate the supply register near the floor, or high in the side wall, so that the warm air from the register *blankets* a cold wall, and mixes with the cold air descending from the exposed walls and glass. A second method is to locate the supply openings near the floor, or high in the side wall, on the inside wall, and the return openings near the greatest outside exposure. A third method is to locate all supply openings around the outside wall, near the source of the greatest heat loss, usually beneath the windows, and to use grilles designed to blanket the cold area. This causes mixing of the warm air delivered with the cool air from the heat loss area and the cold air from infiltration, thus effectively preventing drafts. It has been called *perimeter heating*.

In any case, the warm air registers should be so located and so designed that the air stream never discharges directly against people at rest. Tests² in Warm Air Research Residences No. 1 and No. 2 at the *University of Illinois*, have indicated that nearly continuous blower operation gave better results than intermittent operation. This type of operation is more commonly achieved by suitable adjustments of air quantity and fan switch settings³ than by continuous operation of the blower.³

Supply Outlets and Return Grilles

The type of supply outlet which should be used depends upon the type of distribution system to which it is applied. With perimeter duct systems, the supply outlets are usually located in the floor, in the baseboard, or low in the sidewall and underneath a window. In order to be most effective, perimeter diffusers must deliver the air upward and in a fan-shaped pattern so as to blanket the window or cold wall with warm air, thus mixing with and tempering the cold air which usually descends along a cold surface. Furthermore, since delivery of the air outward into the room, rather than upward, is likely to impinge upon the occupants it should be avoided on two counts. With certain types of perimeter diffusers, the air velocity at the diffuser face is limited only by the pressure available at the diffuser and the noise characteristics of the outlet.

Tests with *inside wall* supply systems conducted in Warm Air Heating Research Residence No. 1 have indicated that comparable results are obtainable with either high side wall or baseboard registers, if proper registers and air velocities are selected.

Baseboard registers should be of a deflecting-diffuser type which throw the air downward toward the floor and diffuse it at the same time. For baseboard registers, air velocities over 500 fpm should be avoided as they may cause discomfort.

High side wall registers should be of such type that the air is delivered horizontally or in a slightly downward direction, and should be so located as to avoid impingement of air on ceiling or wall. Directional flow diffusing type registers should be used to insure best results. Register air velocities should be such that the air velocity will be about 50 fpm three quarters of the distance from the register to the opposite wall.

Velocities through registers may be reduced by the use of registers larger than the connecting ducts. Diffusers should be used to spread the air uniformly over the register face. Basic rules for the location and selection of registers, together with explanations of factors affecting operation, are

given⁴ in Section 6 of Manual 4, Sections 3 and 4 of Manual 10, or Section B of Manual 7, published by the *National Warm Air Heating and Air Conditioning Association*.

Registers should be well proportioned and decorated to harmonize with the trim. Air supply registers should be equipped with dampers, and all registers should be sealed against leakage around edges. The register types shown in Figs. 1, 2 and 3 have been recommended as standard by the *National Warm Air Heating and Air Conditioning Association*.

Return-air grilles may be located in hallways, near entrance doors, under windows, in exposed corners or inside walls, depending on location of supply outlets. Baseboard returns are preferable to floor grilles. It is usually considered desirable to have them located in or near outside walls

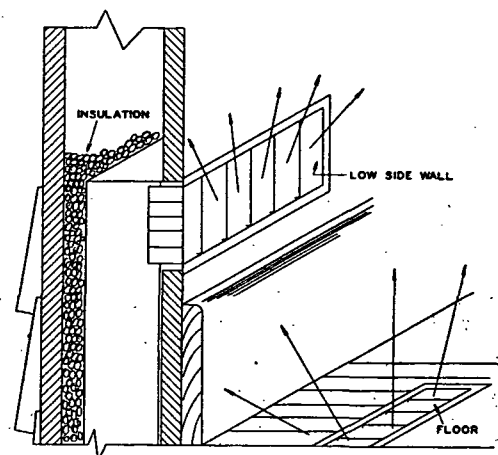


FIG. 1. RECOMMENDED TYPE OF FLOOR OR LOW SIDEWALL INSTALLATION ON OUTSIDE WALL*

* Registers set to direct air upward along the wall at as wide an angle as possible.

when supply outlets are located on inside walls. With this type of system, it is desirable to locate return grilles in as many rooms as possible. When used in perimeter systems, the return grilles may be centrally located. In basementless structures, it is usually convenient to locate the return openings either high in the wall or in the ceiling. So far as the heating is concerned, however, this is merely a matter of convenience because low returns have been found to work equally well. It is usually not recommended in residential systems that any one return serve an area having a heat loss of more than 60,000 Btuh.

Dampers

Suitable dampers for air direction or volume control are essential to any duct system. Special care must be used in the design of any system, to minimize resistance. Sharp elbows, angles, and offsets should be avoided. Three types of dampers are commonly used. *Volume dampers* are used to completely cut off or reduce the flow through ducts. *Splitter dampers* are