TYPES OF SUPPLY AND RETURN OPENINGS

Wall type openings are: perforated plates, vaned outlets, registers, slotted outlets, and ejector nozzles.

Perforated Outlets

Due to the non-adjustability and small vane ratio perforated sheet metal outlets, although inexpensive, have not met with favor as wall type supply openings. They are useful primarily where directional air control is unnecessary, and for return air openings.

Vaned Outlets

Outlets equipped with both vertical and horizontal adjustable vanes are particularly suited to sidewall distribution. For proper control over the air flow, the vane ratio should be from 1 to 2. Outlets with non-adjustable vanes may be employed but they should only be used where the performance is not critical or can be adequately predicted. Vanes should be properly designed to prevent an increase of noise above permissible level.

Registers

Fixed vanes or perforated grilles equipped with a vane damper are termed registers. They are used primarily for residential heating systems, where the outlet distribution is not critical and low cost is of importance.

Slotted Outlets

Slotted outlets essentially consist of either flat steel plates containing a number of long narrow slots or a single long narrow slot. In order to give a good conversion from static pressure to velocity pressure, the sides of the slots are rounded to give a venturi effect. Due to their high aspect ratio, the slotted outlets have a greater induction effect than the comparable vaned outlets of equal area and consequently the throw is reduced. They are primarily useful where an unobtrusive means of distribution is desired, and where it is desirable to submerge the outlets into the room decoration and to minimize the effect of obstructions in the line of discharge. They are adaptable to narrow rooms of low ceiling. In this case the slots are run full length of the room.

Since these outlets offer greater induction at a given noise level, they are useful in obtaining proper air motion under certain design limitations. One disadvantage, however, is that air quantity and distribution must be carefully planned as correction after installation is difficult.

Ejector Nozzles

Ejector Nozzles refer to outlets which operate at high static pressures, which are constructed to give a high conversion from static in the duct to velocity pressure in the outlet, and which have a high induction effect due to their high outlet velocity. They are chiefly used for long throws and industrial process installations, such as drying, freezing, cooking, etc. Another type of ejector is sometimes referred to as a *louver nozzle* having a 45 to 90 deg elbow, which can be rotated similarly to a universal joint about an axis perpendicular to the surface to which it is fastened. These outlets give a considerable degree of adjustability and are, therefore, desirable for use in confined spaces where spot cooling is employed.

Ceiling Outlets

In ceiling outlets when the jet is circumferential and covers 360 deg, greater quantities of room air can be handled than is permissible with comparable side wall outlets, with a given air motion within the occupied space. Temperature differentials may be higher than for ordinary side wall outlets but may not be so high as for outlets with small widely placed slots.

Plaques

When plaques are used, the air from the supply opening impinges against a plate, which, with proper inlet conditions, permits the air to discharge radially. The stream is discharged horizontally in all directions. In certain applications a properly designed plaque yields satisfactory results.

Ceiling Diffusers

This type of outlet is a round, or, in some cases, rectangular outlet, which incorporates guide vanes into its construction.

The air pattern is determined from the contour and design of the guide vanes. In some units the air streams are projected horizontally, the performance being similar to that of well designed plaques. In others the air stream is projected downward. Others produce air streams at varying angles to the ceiling.

Perforated Ceilings

This method obtains air diffusion by discharging air through perforations in the ceiling, the free area being usually less than 15 per cent. The advantages are appearance and the ready application of sound absorbing material to the design. Also, if designed properly, this system provides a low rate of room air motion and consequently lends itself to applications having high load or high ventilating requirements. The perforations should be kept free of accumulations of dirt, as clogging will cause uneven distribution. Dirt will also smudge the ceiling. Best results are obtained in systems having efficient cleaning devices.

In using perforated ceilings for air distribution it is advisable to counteract the wall and glass heat losses by local heating means.

Perforated Panels

Perforated panels are used in some installations, their gross area usually being less than 25 per cent of the ceiling area. A downward jet pattern is obtained without any directional control. The jet velocities are higher than used in perforated ceilings, in order to produce proper diffusion.

Air volume is controlled by controlling the static pressure in the individual plenum chambers that serve the panels.

OUTLET LOCATIONS

In selecting the location of outlets, consideration must be given to the factors of physical construction, physical appearance, location of heating or cooling loads, and outlet performance.

1. The *physical construction* of a building, particularly of old buildings, immediately places limitations on the type of distribution system which