

TABLE 2. RECOMMENDED RETURN GRILLE FACE VELOCITIES

GRILLE LOCATION	VELOCITY OVER GROSS AREA FPM
Above occupied zone.....	800 up
Within occupied zone, not near seats.....	600-800
Within occupied zone, near seats.....	400-600
Door or wall louvers.....	500-700
Undercutting of doors (through undercut area).....	600

3. *Capacity.* The *Catalog Data Section* or manufacturers rating sheets may be consulted for selection of the proper number of outlets for a given air quantity. Due to their high induction ratio, ceiling outlets will in general handle more air per outlet than either comparable sidewall or floor outlets.

4. *Noise.* The noise of an outlet is primarily the function of the outlet velocity and size, and secondarily of the outlet construction. The maximum acceptable noise level in a space may completely dictate the permissible outlet velocities that may be employed. (See Chapter 33 for discussion of permissible room noise levels and noise generated by outlets.)

5. *Room Air Motion.* The factors leading to high air motion are excessive velocity, high air volume per square foot of outlet wall area, overblow, striking of beams causing a spilling of the air into the zone of occupancy, and heating in severe climates by means of ceiling outlets which are directed downward.

6. *Dirt.* Although the primary air may be carefully filtered, dirt from the conditioned space may be deposited on the walls or ceiling wherever there is considerable secondary air motion. With ceiling outlets, dirt streaking may be minimized by carefully streamlining the discharge of the outlets. With wall outlets, dirt streaking may be minimized by not directly impinging the air on any ceiling or room surface. Floor outlets may offer objection as dirt collectors.

RETURN AND EXHAUST GRILLES

Where the air supply causes a relatively large induction effect, only three factors govern the selection and application of return and exhaust grilles: (1) velocity in occupied zone adjacent to grille, (2) permissible pressure drop through grille, and (3) noise.

Velocity

Air handled by an exhaust or return grille is drawn from all directions, the velocity dropping off rapidly in every direction. The only locality where drafts may prove objectionable is adjacent to the grille. To prevent excessive air motion in the occupied space due to the return system, it is

TABLE 3. APPROXIMATE PRESSURE DROPS FOR LATTICE RETURN GRILLES
Inches Water Gage—Standard Air

PER CENT FREE AREA	FACE VELOCITY, FPM						
	400	500	600	700	800	900	1000
50	0.06	0.09	0.13	0.17	0.22	0.28	0.35
60	0.04	0.06	0.09	0.12	0.16	0.20	0.24
70	0.03	0.05	0.07	0.09	0.12	0.15	0.18
80	0.02	0.03	0.05	0.07	0.09	0.11	0.14

advisable to compute the total air motion toward the exhaust opening as outlined in Equation 5 where A is the exhaust wall area in square feet. Recommended return grille face velocities are given in Table 2.

The withdrawal of air from a space through a return grille is a minor factor in control of the room air motion. The control of the room air motion for the maintenance of comfort conditions depends on the proper selection of the supply outlets. Thus the location of the return grille is not critical, nor the use of an elaborate return system necessary, provided the air motion in the occupied zone adjacent to the grille does not exceed comfort limits. A single return grille or a few large grilles will prove satisfactory provided no local high velocity zones are created.

The permissible pressure drop will depend on the choice of the designer. Table 3 gives pressure drop through plain lattice grilles as a function of free area and face velocity.

Noise

The problem of noise generated by return exhaust grilles is the same as that generated by supply outlets. In computing resultant room noise levels from the operation of an air conditioning system, the return grille

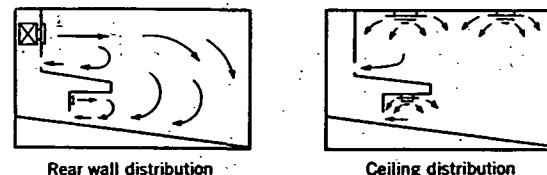


FIG. 7. AIR DISTRIBUTION METHODS FOR THEATERS, CHURCHES, AND AUDITORIUMS

must be included as a part of the total grille area. The only difference between the supply and return grilles is in their frequent installation at the ear level. When located at ear level, it is recommended that the return grille velocity be 75 per cent of the maximum permissible outlet velocity.

Ceiling locations are recommended for bars, kitchens, lavatories, dining rooms, club rooms, etc., where warm air will gravitate to the ceiling level. Ceiling returns are less desirable in spaces with severe winter exposure, and where stratification of cold air may take place at the floor level. During the heating season the air will tend to short circuit between the supply and the ceiling exhaust or return grilles.

Floor Location

Where ceiling or high sidewall distribution is used for winter heating, floor returns along the exposed wall will tend to improve the heating performance of the system. In general floor locations are collectors of dirt and refuse.

Wall and Door Locations

Depending on their elevation, wall returns have the characteristics of either floor or ceiling returns. In large buildings with many small rooms,