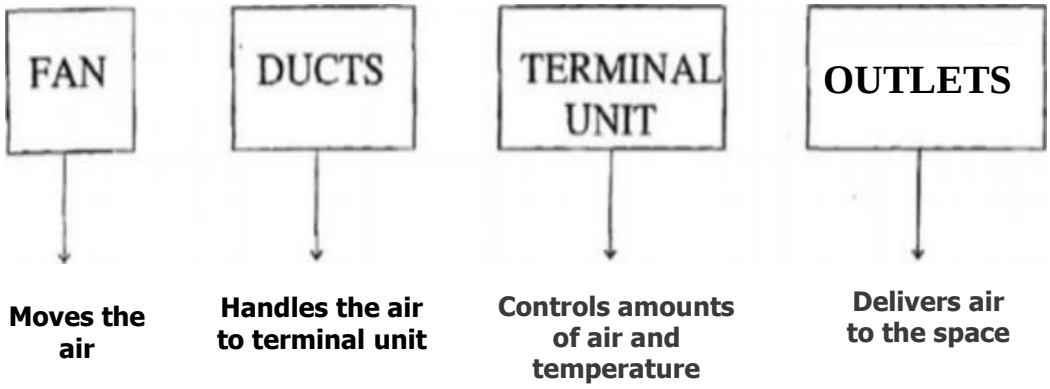
Air distribution

There are four components of air distribution:



2.3 Methods of air distribution in conditioned space

There are several methods of distributing the conditioned air inside the rooms depending upon the purpose for which the space is to be used and the space available for locating the inlet and outlet grilles.

(A) Supply and return grilles in the same wall

Fig. 2.9 shows such a method which is most suitable for summer air conditioning. The method is cheap and simple, but suitable when comparatively high velocity of air at the inlet grille can be maintained. The velocity must be sufficient so that the supply air can reach up to the opposite wall, but it should not have the impingement on the walls which may cause objectionable downward and reverse draft.

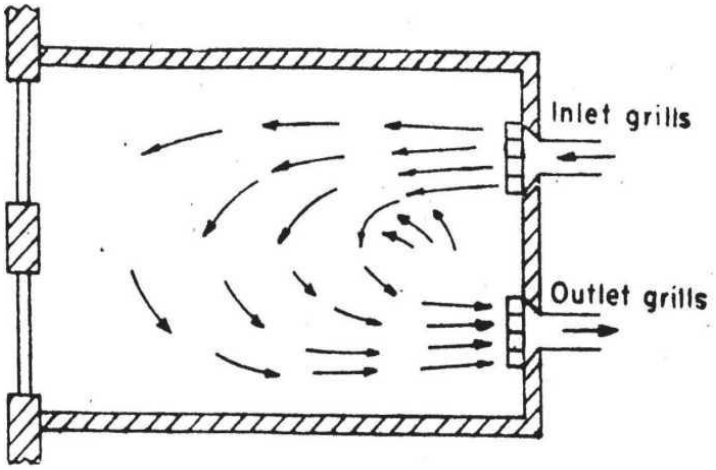
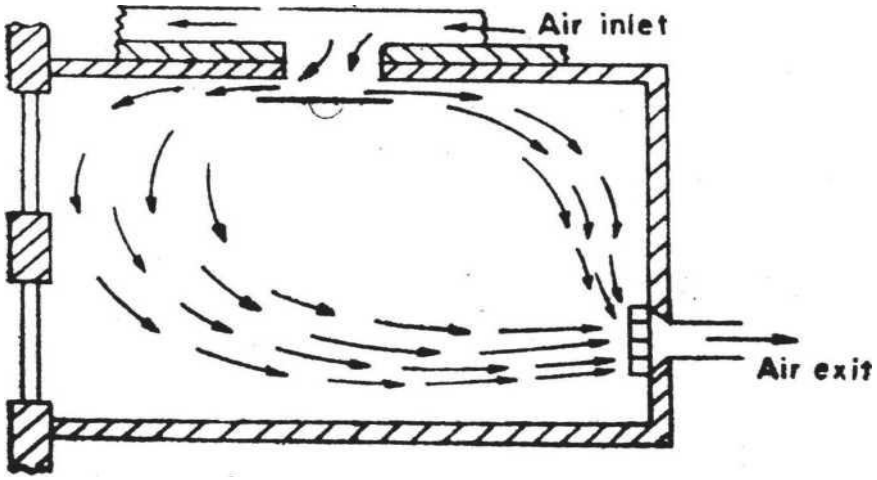


Fig. 2.9 Supply and Return grilles in Same Wall

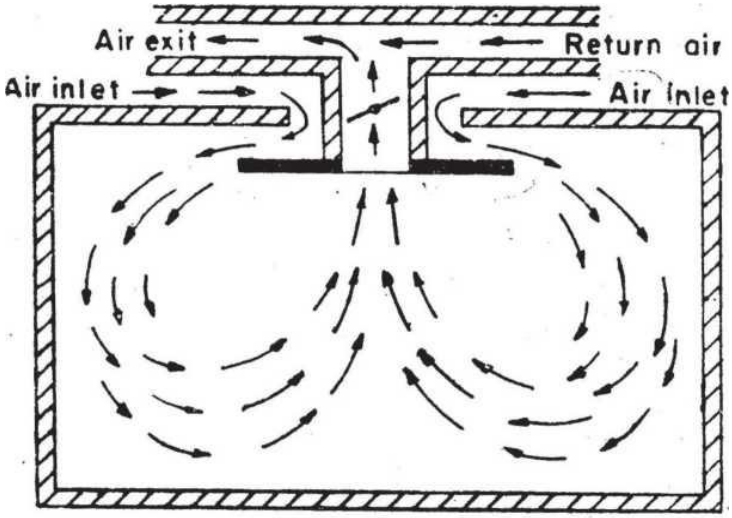
(B) Pan Type Arrangement

The pan type arrangement of supply air provides the uniform discharge around its perimeter. The air distribution is more uniform in this case than in the previous arrangement. This arrangement can be obtained by either locating the outlet in one of the adjacent walls as shown in the **fig. 2.10 (a),** or by combining the supply and return openings in the same single unit. The arrangement of **fig. 2.10 (b)** gives better distribution of air in the room. The system is more useful when the ducts cannot run in the partitions or columns. The pan or plate is generally ornamented to harmonize with the decorations. The objection to this method is that it may when used for winter heating produce large ceiling to floor temperature differentials.



Elevation

Fig. 2.10 (a) Ceiling Diffuses and Side Wall Outlet

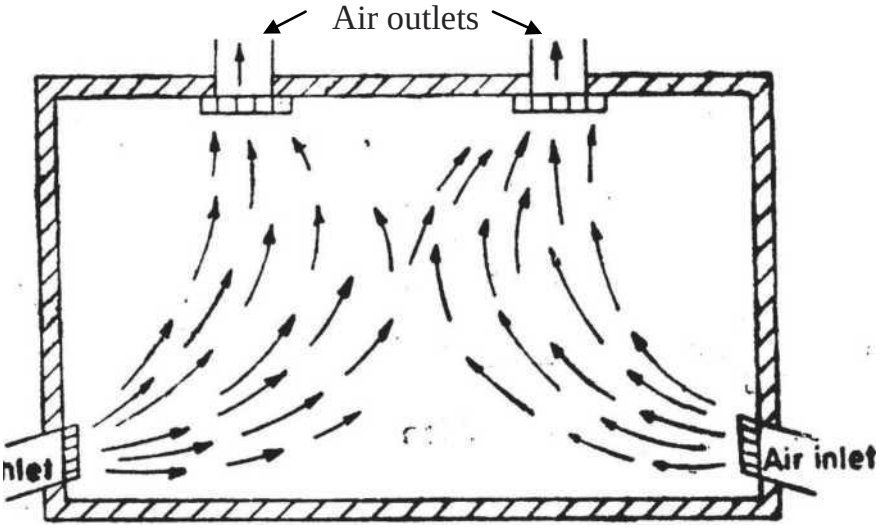


Elevation

(b) Supply and Return air in one Unit
Fig. 2.10 Pan Type Arrangement

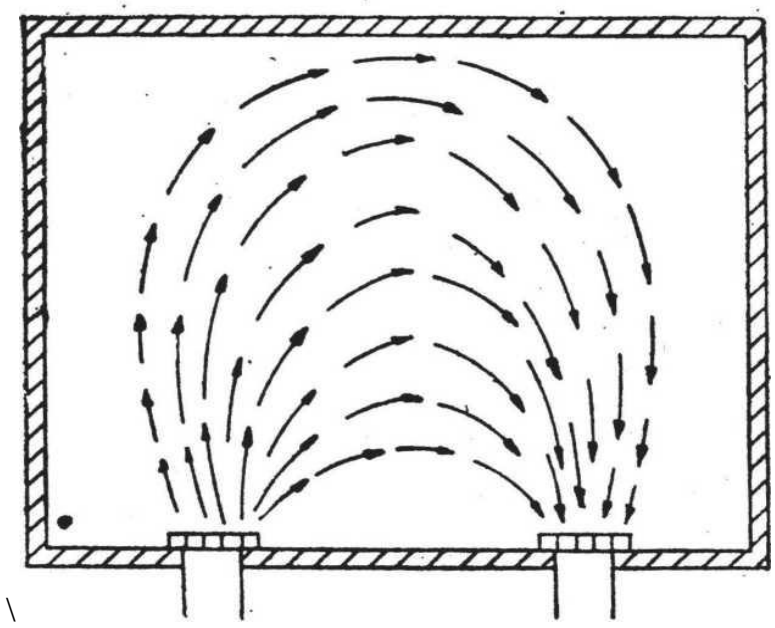
(C) Heating and Ventilating Arrangement

When the hot air is supplied for heating purposes only, the inlet can be located near the floor and the outlet at the ceilings. The arrangement is shown in the **Fig. 2.11 (a).** The incoming air must be supplied at low velocity to avoid the uncomfortable drafts. When only ventilation is required the arrangement, as shown in the **Fig. 2.11 (b)** can also be used. These methods are suitable only for winter air conditioning of dining rooms and smoking places etc.



Elevation

fig. 2.11(a) heating arrangement

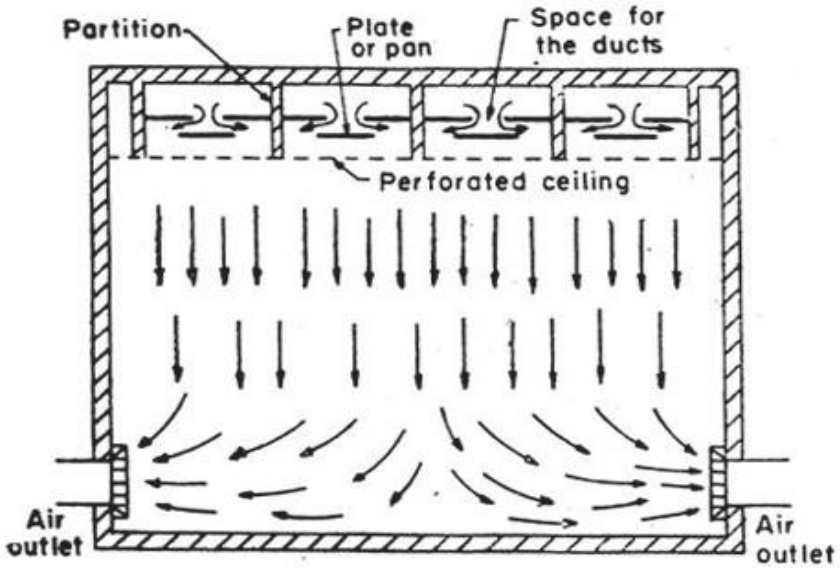


Elevation

Fig. 2.11 (b) Heating and Ventilating Arrangement

(D) Perforated Ceiling Supply

For summer air conditioning of railway bogies, public buildings and industrial buildings, the air is commonly supplied through the perforated ceilings of the room and the space between the perforated sheet and ceiling being supplied with conditioned air. By this method it is possible to supply large quantity of air without causing any draft effect to occupants. The diffusing effect of the air stream create better mixing with the room air. The arrangement is shown in the **fig. 2.12.** When the occupancy is very high, both ceiling and floors can be perforated, which further provides better distribution of air. The disadvantage of this system is the high cost of construction. For heating purposes the floor is perforated and the inlet and exit are provided near the side walls. The method further helps in absorbing sound and gives unconstructive appearance specially for low ceiling spaces.

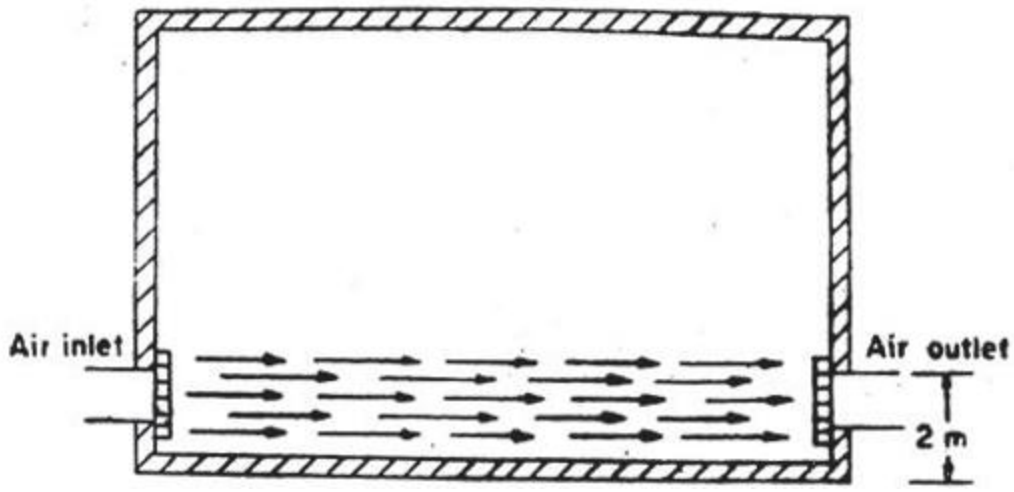


Elevation

Fig. 2.12: Perforated ceiling supply

(E) Air supply to gymnasium and recreation Space

To spaces, where the occupants are very active, air is supplied directly and continuously around the occupants. Sueh an arrangement is shown in the **fig. 2.13.** By this arrangement most of the air is made to flow within a height of 2 meters from the floor. The inlets and outlets are placed at an elevation of about one and a half meter only. The air flows directly around the occupied space maintaining the heat balance of the occupants and removes the vapors of bad odors too. The method is equally good for winter and summer air conditioning.



Elevation

Fig. 2.13: Air supply to gymnasium and recreation Space

(F) Air supply to theaters and auditoriums

The air handling unit is placed at one place preferably in the centre and the air is then supplied from different locations to the air conditioned space. There are three methods by which air can be supplied to the space. These methods are based upon the direction of air flow. In all systems, the supplementary supply air is maintained through several wall openings on account of the space being generally very large.

(i) Upward Flow System :

Fig. 2.14 (a) shows such a system, in which air supply inlets are provided near the floor and near the pedastal chairs of the theatre. The air then flows upward absorbing the space heat. The exhaust air outlets are provided in the side walls near the ceiling or in the false ceiling itself. The system is most suitable for the spaces where the occupancy is large giving rise to high distributed heat load. The body odour and the smoke etc. are also taken up by the return air. The objection in using this supply method for air conditioning is that it is not satisfactory for summer air conditioning. This system also does not provide uniform temperature in the space and may give rise to uncomfortable draft.

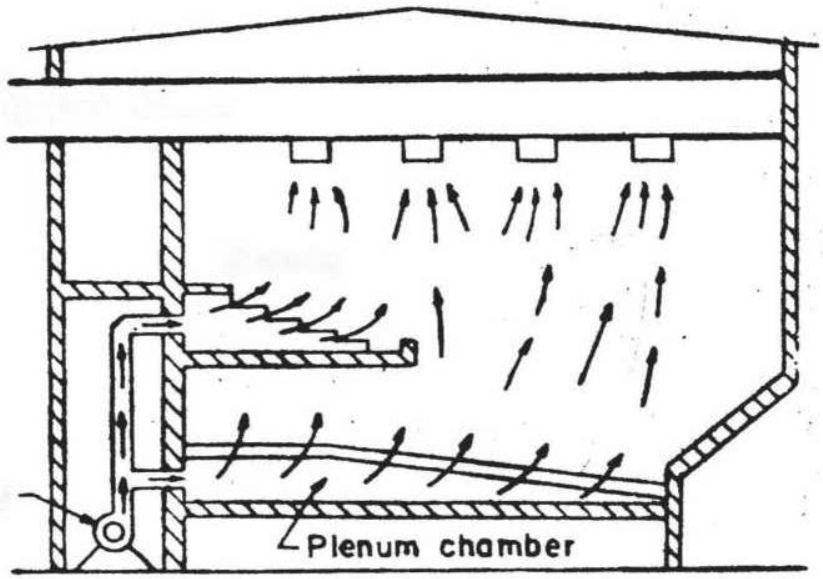
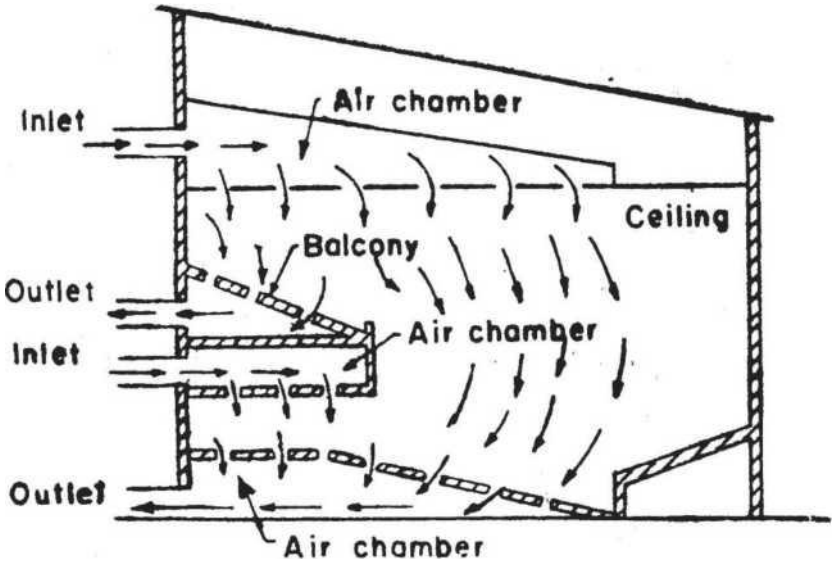


Fig. 2.14 (a) Upward Air Distribution

(ii) Downward flow of supply air:

The system is useful when the ceiling is not free from obstruction. The air is supplied from the top and balcony ceilings, and the return air is taken out from the floor. **Fig. 2.14 (b)** shows such a distribution. The objection of using this type of supply system is that the dust of floor may be taken away by the return air, as such the care must be taken in keeping the floor clean. This system is more useful for summer air conditioning of auditorium and theatres.



Elevation

Fig. 2.14 (b) Overhead Air Distribution System for Theatres

(iii) Ejector Air Supply System

Fig. 2.14 (c) shows such a system. The system can be easily adopted if the ceiling is free from the obstructions. In this type also, the air is supplied from the top through the side wall instead of from the ceiling. The velocity of supply air is kept considerably high in order to have the large approach and diffusion action. The air supply grilles are placed just above the occupied space and the air is injected by the nozzle effect of the specially designed air supply grilles. The return air outlets are located near the floor as shown in the figure. The flow of air inside the conditioned space is also downward as in the **fig. 2.14 (b).**

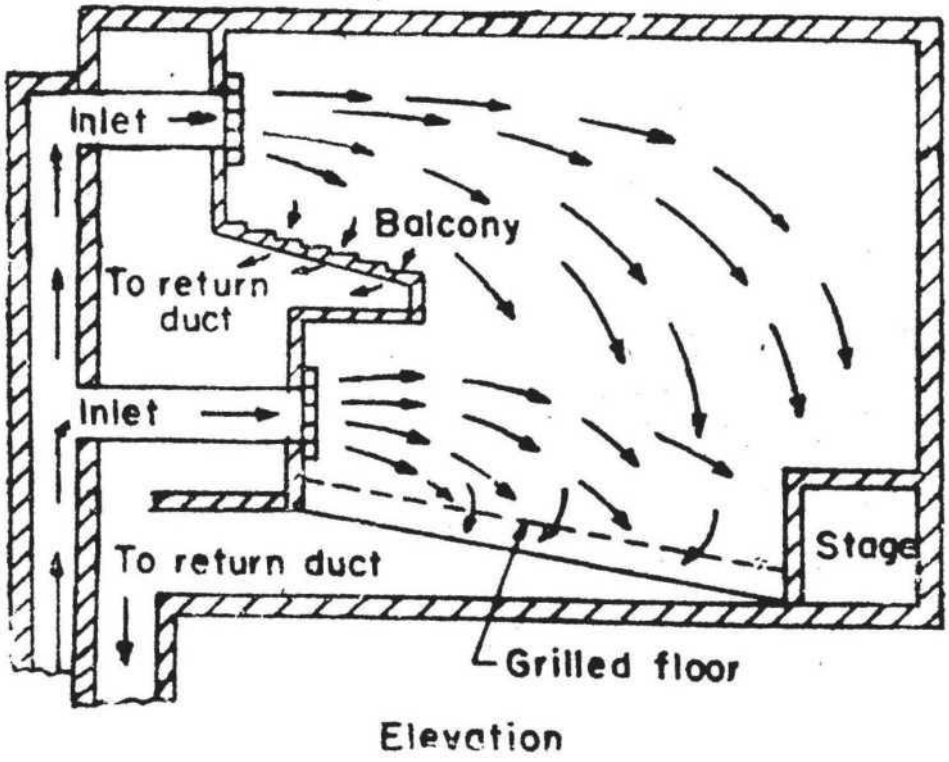


Fig. 2.14 (c) Ejector Air Distribution for Theatre