



Air Distribution Systems

While there is a whole lot of technology and engineering that goes behind *cooling* air, airconditioning systems are not complete without proper *distribution* of that cooled air to the spaces that require the airconditioning.

Hence, air distribution systems are an equally important component of efficient airconditioning.

Air distribution design essentially consists of :

- **ducting** that routes cooled air across the building to the spaces requiring airconditioning,
- **grilles and diffusers** that disperse the cooled air in planned manner into the airconditioned room,
- **return air ducts** that recycle the cooled air, and
- **fresh air intake dampers** that add fresh air as required.

Ducting

Ducts are usually galvanised sheet steel, aluminium sheets or stainless steel sheets, shaped into rectangular boxes or round tubes. They are used to distribute the cool air from the Air Handling Unit (AHU), uniformly throughout the building to be airconditioned. They start at the AHU, or the packaged airconditioner, and travel to the spaces to be conditioned carrying the cool air.

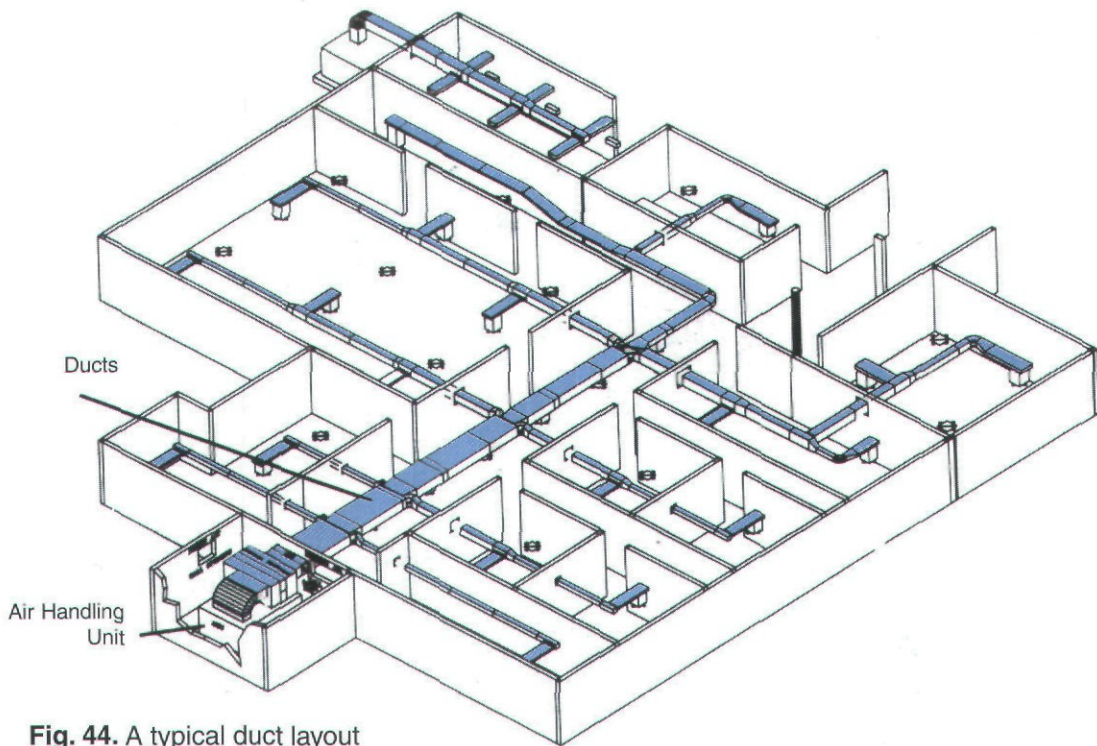


Fig. 44. A typical duct layout

There is also a growing trend to use round flexible hose ducting as branch connectors from the main duct to the diffuser outlets.

Ducting and efficiency

Indifferently fabricated or erected ducting can be a major reason for drop in efficiency of an airconditioning system. Such ducting may result in leakage of cooled air at joints, unequal distribution of the cooled air and loss in velocity at improperly designed bends. All these can contribute towards significantly increasing power bills as a result of inefficiencies in air distribution.

Ducting is therefore a very important area of airconditioning design.



Diffusers and Grilles

The conditioned supply air arrives through the ducts at the **supply air diffusers** and enters the conditioned space. Most diffusers are attached to the false ceiling and a variety of diffusers are available for different air spreading needs. For well distributed cooling, an air flow pattern needs to be created in the conditioned space. The design engineer takes care to separate the supply air diffusers and the return air grilles to prevent short circuiting of the air. Return air usually flows

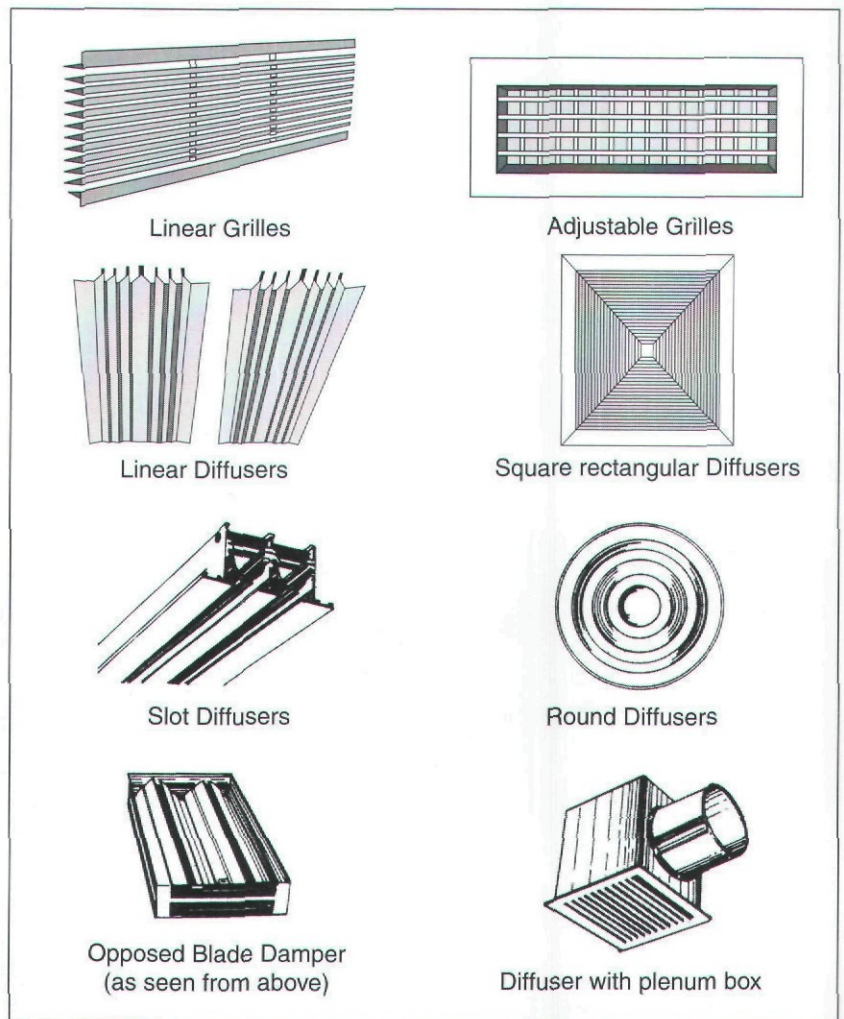


Fig. 45. Some standard Grilles and Diffusers

into the plenum or return-air box through **grilles** placed in the false ceiling.

Return air

Since a substantial amount of energy goes into cooling the air in the first place it is a practice to recycle the air. The air is therefore brought back to the AHU, or the packaged airconditioner, using return air ducts. It is common to route the return air through the gap between the false ceiling and the main ceiling, a space referred to as a '**plenum**'. It is desirable wherever possible to pass the supply air duct through the return air plenum, because this works like a heat exchanger, thereby improving the efficiency of the plant. Sometimes a separate system of return air ducts/boxing is employed to carry the return air instead of using the plenum. Where the supply air ducts do not pass through the plenum, they are usually insulated so that cool air does not pick up heat from the warmer surroundings.

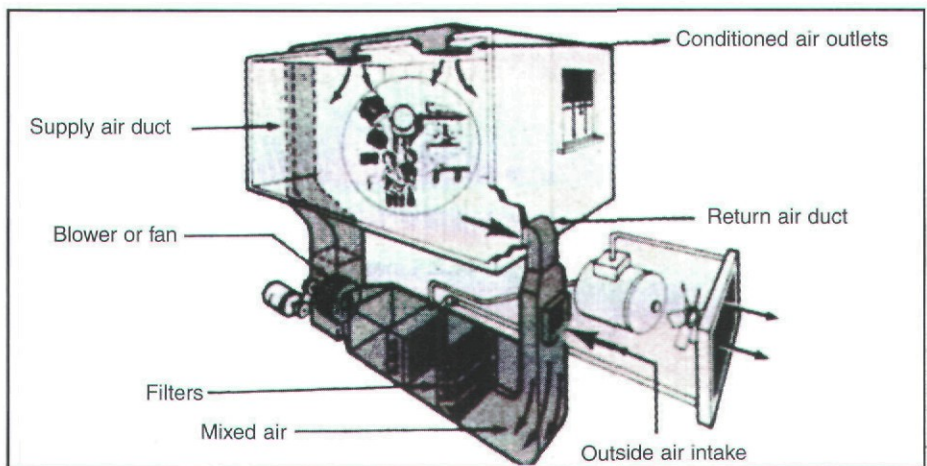


Fig. 46. The Air Cycle



Fresh Air Intake

A certain volume of fresh, outside air is sucked into the building near the AHU. This air is usually drawn in through a 'damper' which is adjusted to allow the specified volume of air into the building. This keeps the **air pressure** within the building a little higher than the outside air pressure. This prevents dusty, moist or any undesirable external air from infiltrating into the building.

Co-ordination between architect and engineer

The vertical and horizontal distribution of air supply systems is a major design issue requiring co-ordination between the architect and the airconditioning engineer. It would be advisable to select the basic system during the early phase of building design. This is because ducting requires to take the optimum route in the space between the false ceiling and the main ceiling avoiding obstructions such as beams, columns and partition walls.



Modern trends in design, fabrication and erection of ducts

Most contractors fabricate the ducting on site according to drawings provided by design engineers. Such ducting is usually fabricated using rudimentary tools and results in inconsistent, poor quality ducting. In recent times however, computer aided design of ducting is being used to determine the optimum duct dimensions.

Modern facilities are being set up to manufacture **machine made ducts***. These ducts are pre-fabricated and shipped to the site for quick and convenient assembly. Though these pre-fabricated ducts cost more than the hand made ones, they have the following advantages:

- Least disturbance at site because ducts come ready made
- Less space required for storage of pre-fabricated sections
- Minimum leakage and vibration noise
- Better designed reinforcement
- Consistent quality because of standardised material at factory

*These ducts are now manufactured in India under the brand name ROLASTAR.