

9.3. VENTILATION

Ventilation process supplies or removes air from a space by natural or mechanical means. Replacement of air is done to remove moisture, odours, smoke, heat, dust and airborne bacteria. Ventilation includes both the exchange of air to the outside as well as circulation of air within the building. Outside air must be brought to a certain temperature by make-up air units for maintaining acceptable indoor air quality in buildings. Ventilation is the process to remove excessive moisture, unpleasant smells, introduce outside air to prevent stagnation of the interior air.

There are two methods used for ventilation purpose :

1. Mechanical or Forced.
2. Natural.

1. Mechanical or Forced Ventilation. For controlling indoor air quality 'mechanical' or 'forced' ventilation is used. While using outside air, excess humidity, odours and contaminants are often controlled via dilution or replacement.

Humid climates require much energy to remove excess moisture from ventilation air. For example : kitchens, bathrooms should have strong mechanical exhaust to control odours and sometimes humidity. In designing of such system there are two major factors, one is flow rate (which is a function of fan speed and exhaust vent size) and the second is noise level. If the ducting for the fans traverse unheated space, the ducting should be insulated as well to prevent condensation on the ducting.

Heat recovery ventilation systems employ heat exchangers to recover some heat from exhausted air, to preheat the incoming outside air. Ceiling fans and table fans are very effective in circulating air within a room.

2. Natural Ventilation. Natural ventilation is the ventilation of a building with outside air without the use of a fan or any other mechanical/forced system.

Natural ventilation can be achieved with operable windows. In more complex systems hot/warm air in the building can be allowed to rise top and then flow out from upper openings to the outside thus forcing cool outside air to be drawn into the building naturally through openings in the lower areas.

9.4. AIR CONDITIONING

Air-conditioning is done through the removal of heat. Heat can be removed through the process of radiation, convection and conduction using mediums such as water, air and special refrigerants (*e.g.*, freon). In order to remove heat from something, we use colder medium. An air conditioner provides cooling, ventilation and humidity control for all or part of a house.

Sensible heat is any heat that raises the temperature but not the moisture content of the substance. Because it raises the temperature it is felt by the senses that's why it is called *sensible heat*.

Latent heat plays an important role in Refrigeration and Air conditioning. Human beings generate Latent heat by way of moisture (perspiration) on the skin. This perspiration requires to be dried and therefore, a change of its state from liquid to vapour is required. Fresh air, which is added into the air system, very often bring in plenty of moisture with it. Removal of this additional moisture also involves latent heat removal.

A portion of the air conditioning heat load is therefore in the form of latent heat. For example, in an office 15% of the air conditioning heat load could be in the form of latent heat. This goes upto around 30% in a restaurant and around 35% in a movie theatre.

An air conditioner manages the five critical constituents :

Air Purity – Advanced filters for the purest air inside

Air Flow – Gets air to every corner of the room

Air Humidity – Maintains optimum humidity levels in all seasons

Air Odour – Removes organic compounds and odour

Air Temperature – Feel comfortable, in summer and winter

Air-conditioning is the conditioning of air for temperature, cleanliness, humidity and directing its distribution to meet requirements of a conditional space. Basically there are two types of air-conditioning one is for providing comfort to occupants of the conditional space and other is industrial air-conditioning, it is used when the primary function is other than comfort, for example food processing, storage of food and other materials.

Main parts in an Air Conditioning system are :

1. **Circulation fan** : Used to move air to & from the room.
2. **Air conditioning unit** : Cooling and dehumidifying process for summer and heating & humidification process for winter.
3. **Supply duct** : It supplies the conditioned air at proper space or point.
4. **Supply outlets** : It distributes the conditioned air evenly in the room.
5. **Return outlets** : It is used to send room air to return duct.
6. **Filters** : It is used to remove dust, dirt and other harmful bacteria from air.

9.4.1. Broad classifications of Air conditioning system. The Air conditioning system may be classified as follows :

1. According to the purpose
 - (i) Comfort air conditioning system
 - (ii) Industrial air conditioning system
2. According to weather of the year
 - (i) Winter air conditioning system
 - (ii) Summer air conditioning system
 - (iii) Year-round air conditioning system.