

AIR AND AIR POLLUTION

Introduction

Air is essential for maintenance of life. The immediate environment comprises of air on which depends all forms of life.

Definition

Air is a mixture of gases that forms environment.

Composition of air

➤ Mechanical mixture of gases.

Nitrogen : 78.1%

oxygen : 20.93%

Carbon dioxide: 0.03%

➤ Other gases which occur in traces, e.g; argon, neon, krypton, xenon and helium.

➤ It also contains water vapour, traces of ammonia, suspended matter such as dust, bacteria, spores and vegetable debris.

Functions of air

✓ Interchange of gases

✓ Thermoregulation

✓ Medium for communication

✓ Medium for spread of pollens and bacteria.

✓ Helps for functioning of auditory and olfactory organs.

The Air of occupied room

Chemical changes:

Increased CO₂ and decreased O₂ due to metabolic processes.

Physical changes:

Rise in temperature, increased humidity, decreased movement, body odour, bacterial pollution.

Discomfort zone:

It is the subjective sensation which the people experience in ill ventilated and crowded rooms.

Comfort zone:

The range of effective temperature over which majority of individuals feel comfortable.

Corrected effective temperature (degree Celsius)

Pleasant and cool	20
Comfortable and cool	20-25
Comfortable	25-27
Hot and Uncomfortable	27-28
Extremely hot	28+
Intolerably hot	30+

Air pollution

Definition

It is the condition when there is excessive concentration of foreign matter in the outdoor atmosphere which is harmful to man and his environment.

Sources of air pollution

- Industrial sources
- Domestic sources
- Scientific research
- Transportation
- Agriculture
- Other sources (Burning refuse, incinerators)

Air pollutants

More than 100 are identified

- ✓ Carbon monoxide
- ✓ Sulphurdioxide
- ✓ Lead
- ✓ Carbon dioxide
- ✓ Methane
- ✓ Cadmium
- ✓ Ozone

Indicators of air pollution

- ❖ Smoke index.
- ❖ Percentage of sulphur dioxide in air.
- ❖ Air pollution index.
- ❖ Grit and dust measurement.

Effects of air pollution

1. Health aspects:
 - Temporary effects: Discomfort, cough, bronchitis, breathlessness, irritation of eye.
 - Permanent effects: Lung cancer, asthma, chronic bronchitis.
2. Social and economic effects: Damage of buildings, destruction of animal life, erosion of metals.
3. Plant: Retardation in the growth.

Agent	Sources	Adverse effect
Oxides of N ₂	Automobile exhaust, gas stoves, wood burning, kerosene, heaters.	Respiratory irritation, bronchial hyperactivity, impaired lung defenses.
Hydrocarbon	Automobile exhaust, cigarette	Lung cancer
Ozone	Automobile exhaust, high altitude aircraft.	cough., respiratory tract irritation, broncho-constriction
Sulphur dioxide	Power plants, oil refineries, kerosene space heaters	Asthma, COPD, respiratory tract irritation.
Lead	Automobile exhaust	Impaired neuropsychological in children

Prevention and control of air pollution

1. Containment:

preventing pollutants entering into the air. This is achieved by methods such as enclosure, ventilation and air cleansing .

2.Replacement:

Using technology_which does not cause pollution. Increases use of electricity, natural gas, central heating in place of coal.

3.Dilution:

Planting more trees around sources of air pollution, green belts.

4. Legislation:

Clean air act- Government of India enacted “The Air(Prevention and Control pollution) Act in 1981”

5. International Act:

WHO established international network of laboratories for the monitoring and study of air pollution.

DISINFECTION OF AIR

1. Mechanical ventilation:

Removing upper layer of air using exhaust fan. It reduces bacterial density.

2. UV Rays:

UV Lamps are shaded and located in the upper portion of room near the inlet of air.

3. Chemical mists:

Tri-ethylene glycol vapors have been found to be effective air bacterialicides particularly against droplet nuclei and dust .

4. Dust control:

Sprinkling water before sweeping, mopping floor with wet cloth, application of oil to the floors of hospital reduces the bacterial content of the air.

LIGHT

It is essential for efficient vision. Inadequate light causes eye strain, fatigue, poor performance, accidents.

Light factors:

- 1. Sufficiency:** An illumination of 15-20 foot candle is accepted as basic minimum for satisfactory vision
- 2. Distribution:** Uniform, no shadows.
- 3. Absence of glare:** glare is an excessive contrast.
- 4. Absence of sharp shadows:** It causes confusion to eye.
- 5. Steadiness:** Source of light should be constant.
- 6. Colour of light:** Very bright, flashing colour may cause discomfort.
- 7. Surroundings:** When a black object is viewed against dark back ground recognition is difficult.

MEASUREMENT OF LIGHT

It is measured by candle. The illumination received from 1 candle at a distance of 1 foot is known as 1 foot candle.

Illumination of 15-20 candle is accepted as a basic minimum satisfactory vision

Measurement of day light factor =

Instantaneous illumination indoor

X 100

Simultaneously occurring illumination outdoors

NATURAL LIGHTING

It is derived partly from visible sky and partly from reflection

Suggestion to improve natural light:

1. Orientation: Brightness of the light is not constant on east and west.
2. Removal of obstruction:
3. Windows: Should be properly planned.
4. Interior of the room: Ceiling should be white.

ARTIFICIAL LIGHTING

It should be as close as possible to day light

5 systems of artificial lighting:

1. Direct lighting: 99-100% of light is projected directed towards working area.
2. Semi direct: 10-40% of light is projected upwards so that it is reflected back on the object by ceiling.

3. Indirect: 40-100% of light is projected towards the ceiling and walls.

4. Semi-indirect: 60-90% of light is directed upwards and rest downwards.

5. Direct-indirect: light is distributed equal

METHODS OF ARTIFICIAL ILLUMINATION

1. Filament lamps: The electric current heat up the tungsten filament and light is emitted depend upon the temperature.

2. Fluorescent lamp: Lamp consists of glass tube filled with mercury vapor and the electrode fitted at each end.

The inside of the tube is coated with fluorescent chemicals which absorb all the UV radiation

EFFECTS OF LIGHT

- ✓ It stimulates melanin synthesis.
- ✓ Cause invitro degradation of bilirubin.
- ✓ It improves vision.
- ✓ Effects on biologic rhythm of body.
- ✓ Temperature.
- ✓ Activation of precursor of Vit-D.

✓ Activates food consumption.

VENTILATION

The modern concept of ventilation implies not only the replacement of vitiated air by a supply of fresh outdoor air, but also control of the quality of incoming air with regard to its temperature, humidity and purity with a view to provide a thermal environment that is comfortable and free from risk of infection.

STANDARDS OF VENTILATION

1. Cubic space: 300 – 3,000 cuft/person/hour of fresh air.

2. Air change:

Living room: 2-3/hour.

Work room: 4-6/hour.

Total hourly air supply

Air change=

_____ /
cubic capacity of the room

3. Floor space: 50-100 sq.ft/person.

TYPES OF VENTILATION

1. Natural Ventilation:

a. Wind: Active force in ventilation. When it blows through a room it is called perflation.

When there is an obstruction it bypasses and exerts a suction action at its tail end is called aspiration. Doors and windows facing each other provide cross ventilation.

b. Diffusion: Air passes through the smallest openings or spaces by diffusion.

c. Inequality of temperature: Air flows from high density to low density. Hot air is lighter than cold air.

2. Mechanical (artificial) ventilation: Exhaust ventilation: Air is exhausted or extracted to the outside by exhaust fans usually driven by electricity.

3. Plenum ventilation: Air is blown in to the room by centrifuge fans so as to create a positive pressure and displaced.

4. Balanced ventilation: Combination of exhaust and plenum system of ventilation.

5. Air conditioning: Air conditioning is the process of altering the properties of air to more comfortable conditions, typically with the aim of distributing the conditioned air to an occupied space to improve thermal comfort and indoor air quality.

