



# Environment & Health

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# COMPOSITION OF AIR

# Air of occupied room (vitiating air)

The air gets vitiated by physical and chemical changes.

## Chemical changes

Air becomes contaminated by  $\text{CO}_2$  and the oxygen content decreases due to metabolic processes. At rest, 1 person gives off 0.7 c.ft. of  $\text{CO}_2$  per hour.

## Physical changes

- Increase in temperature (400Btu/hr)
- Increase in humidity ( 700gms of water vapours/day)
- Decrease air movement
- Body odors
- Addition of bacteria and viruses

# INDICES OF THERMAL COMFORT

1. Air Temperature
2. Air temperature and humidity
3. Cooling power
4. Effective Temperature
5. Corrected Effective Temperature (CET)
6. McArdle's maximum allowable sweat rate.

# Cooling Power

- Air temperature, humidity and air movement are considered together and expressed as cooling power of the air.
- Kata thermometer
- Not a reliable index of comfort conditions

# Effective Temperature

- Effective temperature is an arbitrary index which combines in to a single value the effects of temperature , humidity and movement of the internal air on the sensation of warmth or cold felt by the human body.
- A criticism of the effective temperature scale is that it ignores the effects of a radiation from the surrounding structures.





# Corrected Effective Temperature

- Improved version of E.T.
- At present C.E.T scales are widely used as indices of thermal comfort

# Comfort Zones

Comfort zones may be defined as the range of effective temperatures over which the majority of adults feel comfortable.

## **Predicted 04 Hours sweat rate( $P_4SR$ )**

Comfort Zone	-----1-3Liters
Just Tolerable	-----3-4.5
Intolerable	-----4.5+

# Air Pollution

Introduction of chemicals, particulate matters, biological materials that cause harm or discomfort to humans or other living organisms or damages the nature into the atmosphere . Air pollution either emitted into the atmosphere or formed within the atmosphere itself.

# Air Pollutants

## vital layer

Within 2 – 3 days after the fresh layer of sand is laid down, a slimy vital layer, (**zoogeleal layer or Schmutzdecke**) is formed at the top of the sand bed.

This consists of **multiple forms of organisms**, including bacteria, diatoms, planktons and algae, embedded in silt and organic matter.

When fully formed it becomes 2 – 3 cm thick. The vital layer is the '**heart**' of the **slow sand filter**

Other types are

- Gaseous air pollutants
- Particulate air pollutants

Air pollutants can be differentiate on the basis of scale:

- Local scale
- Urban scale
- Regional scale
- Hemispheric & global scales

# Indicators of pollution

- Sulphur dioxide
- Carbon monoxide
- Oxidants
- Smoke suspended particles
- Nitrogen dioxide
- Lead
- PAH
- Ozone

## TIGHT BUILDING SYNDROME

‘Tight building syndrome’ is observed in modern airtight office buildings in which, with a view to achieve considerable saving on air conditioning, the indoor air is recirculated. The pollutants that accumulate in the process comprise higher levels of carbon dioxide , sulphuric acid, ozone, cigarette smoke, fibre glass etc.



# TIGHT BUILDING SYNDROME

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# SMOG

- The vertical diffusion of pollutants depends upon the temperature gradient. When there is rapid cooling of lower layers of air , there is little vertical motion and the pollutants and water vapors remain trapped at the lower levels and the result is 'smog'.

# Effects of air pollution

- **Immediate effects**
  1. Nausea
  2. Vomiting
  3. Fever
  4. Annoyance
  5. Headache
  6. Increased respiratory symptoms

# Effects of pollution

## Late effects

1. Anemia
2. Tuberculosis
3. Chronic bronchitis
4. Primary lung cancer

## Effects of air pollution(contd.)

### **Social and economic effects**

- Destruction of plant and animal life
- Corrosion of metals
- Damage to buildings
- Reduced visibility in towns
- Can soil and damage clothings
- Increase cost of cleaning, maintenance, repairs and aesthetic nuisance.

# Effects of air pollution(contd.)

## **Global effects**

- Ozone depletion-----due to CFCs (Aerosol spray, Air conditions, Refrigerators)
- Green house effect
- Acidic rain

# Purification of air

- Natural methods
- Artificial methods

## **Natural methods**

1. Winds
2. Dilution
3. Sunlight
4. Rain
5. Plants



# Purification of air

## **Artificial methods**

1. Containment
2. Replacement
3. Dilution
4. Disinfection
5. Legislation
6. International action













# What If no green house effect?

The earth's average surface temperature of  $14^{\circ}\text{C}$  could be as low as  $-18^{\circ}\text{C}$  and life would not have been possible.

## **Global Warming**

Global warming is the name given to expected increase in magnitude of green house effect where surface of earth is almost inevitably becomes hotter than it is now.

It is also called enhanced green house effect.



# ozone hole

A layer in the earth's stratosphere at an altitude of about 10 km (6.2 miles) containing a high concentration of ozone, which absorbs most of the ultraviolet radiation reaching the earth from the sun.

Over the last hundred years the **ozone layer** has been damaged by man-made chemicals, especially ones called CFCs (chlorofluorocarbons). CFCs were used for various purposes.

**The ozone hole does not go all the way through the layer; on the other hand, it is not a uniform 'thinning' of the layer either. It is a "hole" in the sense of "a hole in the ground", that is, a depression; not in the sense of "a hole in the windshield**











