



Lecture ten

Physiological Reactions to the Environment.

1- Factors affecting human comfort.

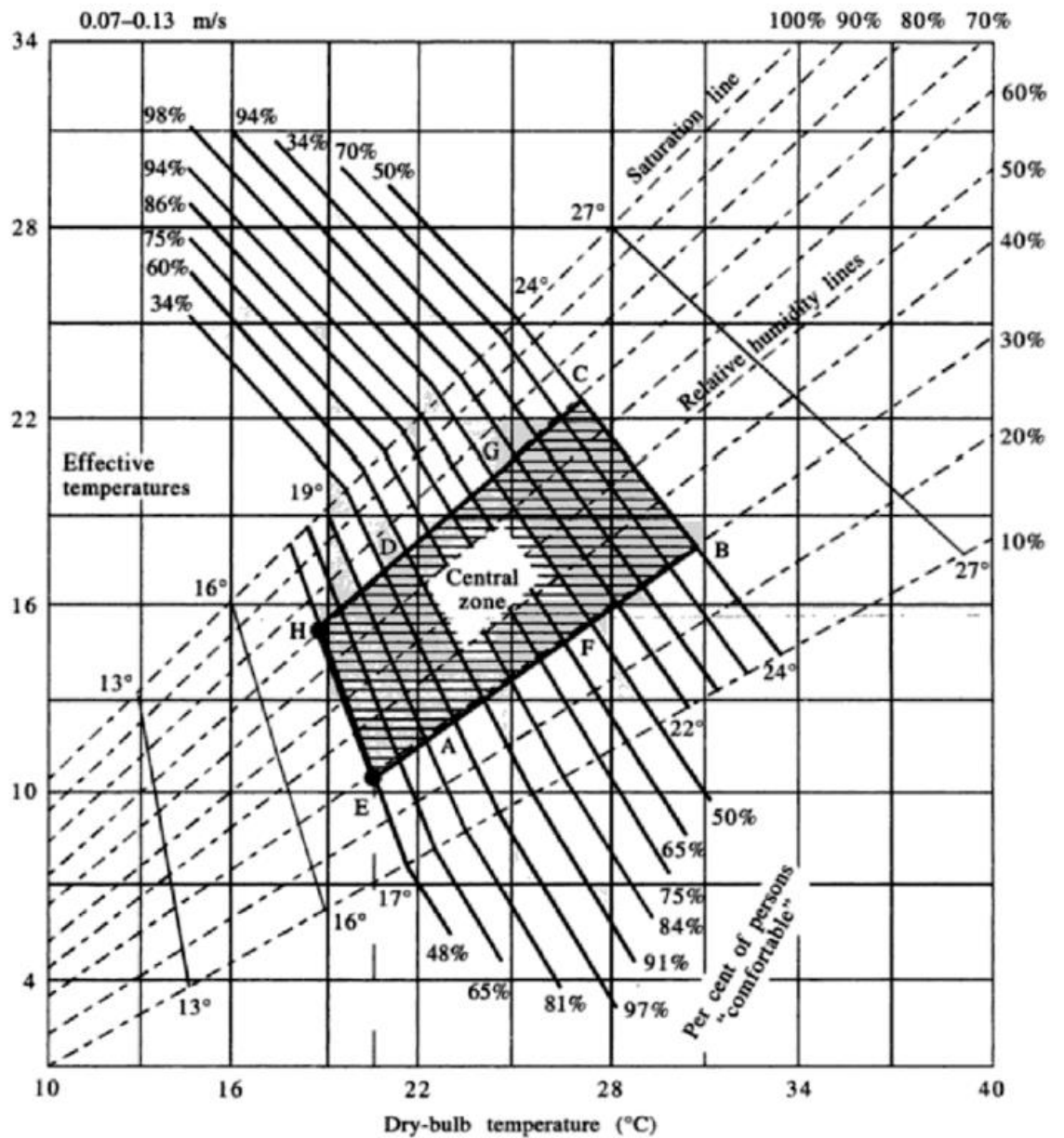
(In order of importance).

1. Temperature: depends on the application, season, activity, etc...
2. Humidity: is acceptable between 30-70%.
3. Air motion & distribution: air motion is necessary but drafts or excessive air motion is objectionable.
4. purity: purity means cleanliness of air from dust, fumes, toxic gases.

Human comfort is dependent on the rate of heat loss from the human body by radiation, convection and evaporation. When the rate of heat generated by metabolism is equal to heat dissipated, man is comfortable.

2- Comfort scales:

- a. Equivalent temperature: British concept which is not very popular. Black cylinder 55cm high & 20cm diameter. Power is fed to the cylinder and regulated to maintain a certain temperature on the cylinder surface to model mans loss by radiation and convection. No account of relative humidity.
- b. Effective temperature (ET): is that index which expresses the composite effect of air temperature, relative humidity and motion on the human body. The numerical value is equal to the temperature of calm (4.5-7.5 m/min) saturated air.



Typical comfort chart



Sumer comfort condition is found between (22-27°C) ET, with 100% occupants comfortable at (21°C) ET.

Winter comfort condition between (18-21°F) ET. With 100% occupants comfortable at (19-20°C) ET.

c. Corrective effective temperature:

Takes account of radiation in addition to the above. Employs globe thermometer reading for the dry bulb reading (thermometer at center of blackened sphere (100mm diameter) in the effective temperature scale.

d. Black globe temperature: Globe temperature by itself is used as an index.

3-heat loss from human body:

The amount of heat generated by the human body depends on five factors which govern or control the metabolic rate.

[a) Age. b) sex. c) health. d) degree of activity. e) motional state].

Type of heat loss are sensible and latent:

-Sensible heat loss by radiation and convection from the skin to surrounding air.

- Conduction by contact is negligible.

- Latent loss by loss of moisture with breath and sweating.

4- Ventilation requirements.

Odors, toxic fumes, smoke, must be removed from a conditioned space by continuously introducing fresh outside air and by removing stale inside air. Smoking is the controlling factor in determining the rate of ventilation.

*Infiltration should be considered while determining the rate of ventilation.



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- * Ventilation air is never introduced into the space directly. It must be conditioned by the apparatus first.
- * Infiltration air enters the space directly and is included in the space load.