

2. Temperature and Humidity in the Indoor Environment

Thermal-Humidity Microclimate

- **Thermal-humidity microclimate** is a component of the indoor environment formed by **thermal and humidity flows**.
- From the point of view of health and comfort, the thermal-humidity microclimate ranks among **the most important component of the indoor building environments**.
- Hygrothermal microclimate is defined by three fundamental factors - **indoor air temperature [°C], indoor relative humidity [%] and air velocity [m/s]**.

Thermal-Humidity Microclimate

- The basic values determining the quality of the thermal-humidity microclimate in buildings are:
 - **Indoor air temperature**
 - **Final temperature of spherical thermometer**
 - **Operating temperature,**
 - **Air flow rate**
 - **Relative humidity**
 - **Specific air humidity**
 - **Dew point temperature**

Thermal-Humidity Microclimate

- **The indoor air temperature** [$^{\circ}\text{C}$] also dry temperature is the temperature around the human body, measured by any temperature sensor unaffected by the radiation of the surrounding areas.
- **Relative humidity** [%] represents the degree of air saturation by water vapor. It is defined by the ratio of water vapor density in air and humid air saturated with water vapor at the same temperature and pressure.
- **The air flow velocity** [m/s] characterizes the movement of air in the space. It is determined by its size and direction of flow. Because the velocity of airflow varies greatly in the space, it is necessary to express its variation with the mean value per time unit.

Thermal Comfort

- **Thermal comfort** can be defined as the state of the environment, which in humans causes welfare and meets his feelings.
- Man does not feel cold nor too warm.
- Thermal comfort is a state of balance between the person and indoor environment without the overburdening **thermoregulatory system**.

Regulation of Thermal Comfort

- Both flows can be regulated in a variety of ways, such as changing activities or clothing.
- Differences between heat produced and heat removed from the body's environment compensate for **thermoregulation mechanisms**.
- **Thermoregulatory processes** are related to age, general health status, nutrition status, motion regime and are directly affected by the thermal and humidity status of the environment.

Regulation of Thermal Comfort

- **The optimal indoor air temperature should be maintained within the range of 19 - 24 °C** if there is no difference between room temperature and room temperature than 2 °C at an air flow rate of approximately 0.2 m/s.
- In the summer, the negative impact of high temperatures on the human organism must be reduced. The recommended maximum indoor air temperature for the summer season is 26 - 27 ° C.

Optimal Humidity of Indoor Environment

- In the summer, high relative humidity associated with high temperature can adversely affect the body's thermal balance by limiting respiration and hence loss of heat. There are many sources of moisture in residential buildings.
- **The optimum moisture of the internal environment fluctuates from 30 to 50%.** The humidity in the range from 30 to 70% is still considered as a comfortable indoor environment.
- Humidity of in the indoor environment should not exceed 70% during the summer.
- In winter, the indoor relative humidity should not fall below 30%.