

3. Acoustic Microclimate Building Noise

Acoustic Microclimate

- **The acoustic microclimate** is an important component of the indoor environment characterized by a large number of sound sources with a wide range of frequencies.
- **Noise is either penetrated from the outside through the building envelope, or the noise is generated directly inside the building.**
- From its source, the noise is transmitted either **by air only**, or transmitted **by building structures and then by air**.

Acoustic Microclimate

- **Acoustics** is a field of physics dealing with the study of sound - the study of the mechanical vibrations and waves in flexible environments, its creation, dissemination and action.
- **Sound** is mechanical waves in a fabric environment that is capable of producing an auditory sensation.
- **Noise** is any unwanted sound that adversely affects the well-being of a person, causes an unpleasant, disturbing feeling, endangering his health.

Acoustic Microclimate

- In terms of the time course, it is recognized:
 - **Stabilized noise** at a given location does not change over time by more than 5 dB
 - **Variable noise** varies over time by more than 5 dB in time
 - Intermittent noise is noise, which suddenly changes the sound pressure level or the sound level, which is steady during the noisy interval
 - **Pulse noise** is generated by individual sound pulses with a duration of up to 200 ms or a sequence of pulses successive at intervals longer than 10 ms

Biological Effects of Noise

- The persistent effect of noise on the human organism is of three kinds:
 - **Effect on hearing organs** - Harmfulness of hearing effects depends on sound level and frequency waves. The more energy is concentrated in the higher frequencies, the lower the noise level is
 - **Effect on the vegetative nervous system** - Reactions are dependent on the subjective perception of the individual
 - **Effect on human psyche** - It is the most complex of effects. Neuroscientists may aggravate the nervous system lability, which is manifested by irritability, insomnia, headaches, memory impairment

Optimization of Acoustic Microclimate

- The optimization of the acoustic microclimate can be done:
 - **Interference to the source of noise**
 - **Intervention in the field of transmission of noise**
- The most effective way to improve acoustic comfort is to **remove or replace the source of noise**. Consideration is also given to organizational measures to **limit major sources or transport** them to **better acoustically isolated places** (covers or dampers).

Optimization of Acoustic Microclimate

- Optimization of acoustic comfort by intervention in the field of transmission can be done by installing barriers, increasing absorption and decreasing the reflectivity of the walls and ceilings or so called **anti-noise**.
- The **principle of anti-noise** method is based on the principle of the propagation of airborne pressure waves. Anti-noise is a mirror image of these waves but phase shifted precisely by 180° . Encounters two waves to each other, interference occurs destructive (waves cancel each other out).