

# Adverse Noise Effects

## Noise Measuring

There are three basic categories where noise is measured:

1. Working environment
2. Apartment house and civil constructions
3. Outdoor space

Then we assess of the type of noise, noise duration or length of exposure of a worker, time distribution during working hours or during the day, number of propagation of impulses, background noise. The selected basic values of noise for the Cz used for determining acceptable values are 85dB in occupational environment, 40dB in apartment houses and civil constructions, and 50dB in outdoor space

## Biological Effects of Noise

It is important to note that, the severity of damaging effects is given by the dose of energy received;

- Strong intermittent sounds with tone components and/or with impulses are biologically more effective than soft and steady sounds;
- The intensity of noise above 120dB can damage cells and tissues, above 90dB are dangerous for the organ of hearing, above 60-65dB for vegetative system and above 30dB for nervous system and psychic state;
- The human hearing system (the ears and the related perception system in the brain) is more sensitive to frequencies in the range 1000-4000Hz. The sensitivity decreases in the direction to higher or lower frequencies. At the same intensity, the sounds of different frequencies do not evoke equally strong perception of hearing;
- Repeated exposure to excessive noise level results in noise-induced hearing loss. After a substantial period of time damage is usually irreversible and this is due to irreversible reduction of hair cells of the organ of Corti (long term repeated action makes them lose their excitability and become extinct that ultimately results in hearing loss, classified as perceptive peripheral disturbances of hearing);
- An increase of the threshold of hearing due to damage by excessive noise presents itself at the frequency of 4kHz which is the characteristic diagnostic symptom of incipient (=beginning to exist/appear) professional hearing loss;
- Presbycusis is the high frequency (4-8kHz) hearing loss that typically accompanies ageing. As high as 83% in people 57-89 on hearing testing;
- Acute damaging of ear is caused by explosion resulting in damage to the eardrum, ear bones and inner ear; blasts affect the organ of Corti, basal, Reissner and tectorial membrane;
- Noise not only has direct effects in auditory functions but also produces other more general behavioural effects as it can interfere with sleep (by either awakening the person or shifting from a deep sleep level to a shallower one);
- Annoyance may also be a response to noise, constant exposure to noise makes people nervous, irritable, and generally unsettled;
- At noise of levels 85dB or more stress reactions can be expected;
- Many physical changes including dilating pupils, rising BP and acid secretion in the stomach occur during exposure to sounds of moderate volume and duration. Most of these changes are temporary but with constant exposure may become permanent and cause somatic problems.

## Prevention and Protection in Occupational Environment

It is important to note the fact that occupation entry examination includes also hearing testing. Audiometric examination is performed in selected occupations.

### Prevention of Hearing Damage

- Not permitting to work in excessive noise;
- Transferring an individual to another post when serious hearing loss has been found or continuing loss of hearing has been proved;
- Noise reduction.

### Ways to Reduce Noise

1. Remove the source of noise or lower it substantially (if it's possible, replacement of noise equipment with a

- less noisy one);
- 2. Encase the source of noise in suitable covering – e.g. brick wall around a compressor;
- 3. Separate exposed workers from the source of noise – e.g. by establishment of control room;
- 4. Increase the distance of noise sources as the energy of noise decreases with square distance;
- 5. Limit the time of exposure – arranging breaks or alteration of workers in noise and calm environment;
- 6. Suitable personal protection aids – e.g. glass wool, cotton wool, safeguards, resonance safeguards, earphone safeguards, masks and helmets against noise. Use of the aids should never be a final solution.

- In case when maximum levels of noise reach more than 115dB, the permitted duration of exposure of persons is usually set up by respective regulations.
- The entrance into an environment with maximum noise level above 140dB should be not allowed even with use of personal protective aids.



Hearing protectors

### Contraindications of Work in Excessive Noise

- Perceptive hearing impairment;
- History of hereditary generative hearing disorders;
- Disturbances of balance organs;
- Sensorineural hearing loss, professional or disturbance from noise syndrome;
- States after sever brain commotion, meningitis, and encephalitis;
- Severe neuroses;
- Severe or long lasting dysmenorrhoea;
- Psychosomatic diseases;
- Age up to 18 years and more than 45.

## Links

### Related articles

- Noise
- Units Describing Human Noise Load

### Bibliography

- BENCKO CHARLES UNIVERSITY, PRAGUE 2004, 270 P, V, et al. *Hygiene and epidemiology. Selected Chapters*. 2nd edition. Prague. 2008. ISBN 9788024607931.