



# About Noise & Hearing

## INTRODUCTION

Our sense of hearing is precious, yet we seldom think about what a fantastic sensory organ our ear actually is. Our ability to communicate with friends, listening to music, or experiencing a child's first laughter is something we take for granted. Unfortunately, for a significant part of the population, this ability is partially or entirely lost, because of exposure to loud noise. Hearing loss cannot be restored but avoiding damage to your hearing is in most cases a matter of choosing the proper protection. Noise is one of the most common yet under rated health risks in the workplace. As much as every fourth work related injury is noise related. Many people exposed to harmful noise levels on a daily basis, never or seldom wear proper protection. The problem is often ignored, since hearing damage rarely cause physical pain. The risk for permanent injury is therefore significant. Typical work environments where noise levels are above safe limit are pulp and paper, construction, mining, forestry and gardening, agricultural, airport crew and most types of industry work. Recent researches have even documented harmful noise levels in preschools.

## THE EAR

The human ear is a fascinating and very sensitive organ. It consists of several small parts that together bring us our wonderful sense of hearing. When a sound wave enters our outer ear, it is lead into the ear canal, hitting the micro thin eardrum which starts to vibrate in sync with the sound waves. These vibrations then create a mechanical reaction involving three small bone parts, – the Hammer, the Anvil and the Stirrup. The Stirrup is attached to the Stapedius-muscle, which in turn react to the signals by pumping fluids inside the inner ear. The inner

ear has a multitude of fine hair cells, which react to the flowing and starts a chemical reaction. In this process, small electrical impulses are transmitted to the brain, which we interpret as sound.

From our industrialized society, we are exposed to a lot of noises, many of them greatly mismatched to our fine hearing. By exposing the ear to high levels of noise, the small hair cells of our inner ear get damaged. They become puffy and lose their elasticity. Over time, hair cells will die and hearing loss occur.

## DEFINITION OF SOUND

Sound is caused by vibrations from a sound source such as a machine, loudspeaker, or the human voice box. Sound is measured in Frequency (Hertz, Hz) and Sound pressure level (Decibel, dB).

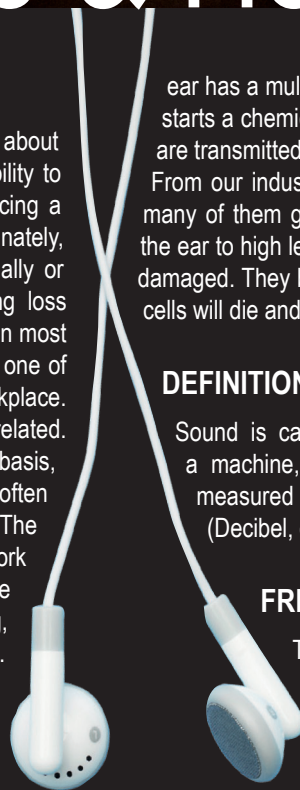
## FREQUENCY

The most common sounds, like that of human speech (500-3000Hz), are found in the High and Middle frequency range. Low frequency sounds (below 500Hz) are usually generated by large engines, ventilation systems, etc.

The human ear can hear sounds in a range between 20 and 20 000 Hz. As we grow older, the ageing process itself, or exposure to high noise levels, causes a decline in our hearing, making it harder to identify high frequency sounds.

## SOUND PRESSURE

The lowest sound pressure level distinguishable by the human ear is 0 dB, and anything above 130 dB is likely to cause pain.





## NOISE

What we call “noise”, is usually described as sounds we experience as unpleasant or disturbing. High level of noise is hazardous to your hearing. Noise can also lead to stress symptoms, discomfort, pain, and increased risk for heart disease.

Harmful noise is everywhere. Loud music, a rock concert, motorsports, target practice or hunting, even mowing the lawn – it could all damage your hearing. These noises are often considered harmless, but they represent significant risk, and call for protection. All noises add to your daily quota of exposure, therefore it is important to wear proper hearing protection at all times.

### NOISE & RISK

Over 30% of all workers are exposed to hazardous noise levels and noise induced hearing loss is the most common reported occupational disease. About 800 million people around the world are affected by hearing loss. It is estimated, that this number will rise to 1.1 billion by 2015 – about 16% of the world's population.

When estimating the risk of hearing damage there are three important factors to consider; exposure time, frequency (Hz) and sound pressure level (dB).

Middle to High frequency noise is the most damaging to your hearing, and should therefore be your primary concern.

Low frequency noise is usually less damaging, but can be dangerous because it masks human speech, alarm signals and it can cause symptoms like dizziness and nausea. Some low frequencies are difficult to block out even with proper hearing protection, because it can transmit directly into the inner ear through your skull

In addition to harmful noise of the steady and longer term kind, peak noises can be equally dangerous. Peak noises are typically those from firearms, hammers, nails guns and other air tools. The brain needs at least 0,3 sec to identify a sound at the right level. Shorter duration is perceived lower than the actual level to our brain. The hearing organ reacts a lot faster.

We do not realize that these noises are harmful to our hearing and we often disregard the need for protection.

## SELECTION

When selecting a hearing protector, consideration should be given to the following factors:

**Sound attenuation** - Hearing protectors should be chosen according to the sound attenuation they will provide. National regulations or other guidelines may stipulate selection criteria for personal hearing protection and place limits on sound exposure. Such relevant criteria and limits should be taken into account in deciding what level of sound attenuation is required.

**Comfort and ergonomic requirements** - The wearer's comfort when selecting an earmuff is of importance to enhance 100 % wear time.

**Compatibility with other PPE** - When combining hearing protection with other protective equipment it is important that the hearing protection attenuation is not impaired due to the combination. For example the side arms of spectacles should be of a low profile type to not disturb the seal of the earmuff.

### REMEMBER

- Hellberg recommends that the level under the hearing protector (at the ear) should be between 70-80 dB(A). A hearing protector should not afford unnecessarily high attenuation because it may cause difficulties with communication and the hearing of warning signals.
- Hearing protectors must be worn all the time in noisy environments. If only worn for 4 h out of an 8 hour working day, the effective protection provided by any hearing protection is not more than 3dB.
- Attenuation performance can be affected negatively by factors such as long hair, incorrect fitting or combination of other PPE equipment. If you are uncertain if your other equipment will affect the attenuation it may be wise to choose a hearing protection with a higher protection level.
- It is just as important to protect yourself from noise during your spare time as it is during the working day.

