

# Noise

## Noise - Auditory Effects

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## What kinds of health effects can be caused by exposure to noise?

Noise exposure can cause two kinds of health effects. These effects are non-auditory effects and auditory effects. [Non-auditory effects](#) include stress, related physiological and behavioural effects, and safety concerns. Auditory effects include hearing impairment resulting from excessive noise exposure. Noise-induced hearing loss (NIHL) is the main concern related to occupational noise exposure.

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## What are examples of auditory health effects?

The main auditory effects include:

### Acoustic trauma:

Sudden hearing damage caused by short burst of extremely loud noise such as a gun shot.

### Tinnitus:

Ringling or buzzing in the ear.

## Temporary hearing loss:

Also known as temporary threshold shift (TTS) which occurs immediately after exposure to a high level of noise. There is gradual recovery when the affected person spends time in a quiet place. Complete recovery may take several hours or days (up to 48 hours).

## Permanent hearing loss:

Permanent hearing loss, also known as permanent threshold shift (PTS), usually progresses constantly as noise exposure continues month after month and year after year. Most individuals do not notice the impairment at first. The hearing impairment is noticeable only when it is substantial enough to interfere with routine activities. At this stage, permanent and irreversible hearing damage has occurred. Noise-induced hearing damage cannot be cured by medical treatment and worsens as the noise exposure continues.

When the noise exposure stops, the person does not regain the lost hearing sensitivity. As the employee ages, hearing may worsen as "age-related hearing loss" adds to the existing noise-induced hearing loss.

Permanent hearing loss can also occur from a single traumatic event.

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## What are the characteristics of permanent noise-induced hearing loss?

The main characteristics of noise-induced hearing loss are:

- Noise exposure can result in a permanent hearing loss that may affect speech communication.
- Noise-induced hearing loss is a cumulative process: factors that determine hearing loss include the overall noise levels, the composition (characteristics) of the noise, the exposure time over a typical work day, and the worker's work history (days, weeks, years).
- Noise-induced hearing loss occurs randomly in exposed persons.
- Some individuals are more susceptible to noise-induced hearing loss than others.
- Permanent hearing loss is caused by damage to certain inner ear structures – these structures cannot be replaced or repaired.
- At a given level, low-frequency noise (below 100 Hertz (Hz)) is less damaging compared to noise in the mid-frequencies (1000 - 3000 Hz).
- In the initial stages, noise-induced hearing loss is most pronounced at 4000 Hz but it spreads over other frequencies as noise level and/or exposure time increases.

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## Does aging affect hearing?

Hearing sensitivity also declines as people become older. This medical condition is called presbycusis. Again, just like noise-induced hearing loss, everyone is not affected equally. Age-related hearing loss adds to noise-induced hearing loss. As such hearing ability may continue to worsen even after a person stops work in a noisy environment.

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## What are some other causes of hearing loss?

Noise affects the hearing organs (cochlea) in the inner ear. This fact is why noise-induced hearing loss is sensory-neural type of hearing loss. Certain medications and diseases may also cause damage to the inner ear resulting in hearing loss as well. Generally, it is not possible to distinguish sensory-neural hearing loss caused by exposure to noise from sensory-neural hearing loss due to other causes. Medical judgement, in such cases, is based on the noise exposure history. Workers in noisy environments who are also exposed to vibration (e.g., from a jack hammer) may experience greater hearing loss than those exposed to the same level of noise but not to vibration.

Some chemicals are ototoxic; that is, they are toxic to the organs of hearing and balance or the nerves that go to these organs. This fact means that noise-exposed workers who are also exposed to ototoxic chemicals (e.g., toluene, styrene, carbon disulfide, specific types of antibiotics, etc.) may experience more hearing damage than those who exposed to the same noise levels without any exposure to ototoxic chemicals.

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## How is hearing loss measured?

Hearing loss is measured as threshold shift in decibel (dB) units using an audiometer. The 0 dB threshold shift reading of the audiometer represents the average hearing threshold level of an average young adult with disease-free ears. The PTS (permanent threshold shift), as measured by audiometry, is dB level of sounds of different frequencies that are just barely audible to that individual. A positive threshold shift represents hearing loss and a negative threshold shift means better than average hearing when compared with the standard.

Audiometric testing is usually done annually. By comparing an individual's results from year to year, changes can be detected, often before the individual notices any change themselves.

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