



NOISE AND HEARING CONSERVATION

Noise is more than a nuisance; it is a hazard, too. It can temporarily or permanently damage hearing. Many accidents are attributable to noise because workers are unable to hear instructions or warning signals. It can also create stress that affects a person's physical and mental well being.

OCCUPATIONAL NOISE EXPOSURES

Noise, or unwanted sound, is one of the most pervasive occupational health problems. It is a by-product of many industrial processes. Exposure to high levels of noise causes hearing loss and may cause other harmful health effects as well. The extent of damage depends primarily on the intensity of the noise and the duration of the exposure.

Although noise-induced hearing loss is one of the most common occupational illnesses, it is often ignored because there are no visible effects; it usually develops over a long period of time, and, except in very rare cases, there is no pain. What does occur is a progressive loss of communication, socialization, and responsiveness to the environment.

Noise-induced hearing loss can be temporary or permanent. Temporary hearing loss results from short-term exposures to noise, with normal hearing returning after a period of rest. Generally, prolonged exposure to high noise levels over a period of time gradually causes permanent damage. Similarly, in its early stages, when hearing loss is above 2,000 Hz (Hertz), it affects the ability to understand or discriminate speech; as it progresses to the lower frequencies, it begins to affect the ability to hear sounds in general.

The effects of noise can be simplified into three general categories:

- Primary Effects - includes noise-induced temporary threshold shift, noise-induced permanent threshold shift, acoustic trauma, and tinnitus.
- Effects on Communication and Performance - includes isolation, annoyance, difficulty concentrating, absenteeism, and accidents.
- Other Effects - includes stress, muscle tension, ulcers, increased blood pressure, and hypertension.



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SOUND WAVES

Sound consists of pressure changes in a medium (usually air), caused by vibration or turbulence. These pressure changes produce waves emanating away from the turbulent or vibrating source. It is:

- Frequency - This is the pitch (high or low) of a sound. It is measured as the number of complete sound wave cycles per second. High frequency noises are more damaging to hearing than low frequency noises.
- Intensity - This is the loudness of a sound. It is measured in decibels (dB).

Industrial noise is a mixture of frequency and loudness. It is measured in dBA which takes into account both measurements, in the same way that the ear hears sound.

THE EAR

The ear is a complex and delicate organ that can be easily damaged if not looked after. The way in which we hear is:

- Sound waves enter the ear canal and cause the eardrum to vibrate.
- Vibrations pass through three connected bones into the middle ear; this sets fluid moving in the inner ear.
- Moving fluid bends thousands of delicate hair-like cells that convert the vibrations into nerve impulses; which are carried to the brain by the auditory nerve.
- The brain converts these impulses into what we hear as sound.

NOISE LEVELS AND LIMITS

Some commonly encountered sound levels are:

LEVEL dBA	TYPE OF NOISE
0	Weakest sound we can hear
21	Quiet room
62	Normal conversation
80	Manual machinery
90	Air cooled 50 kw electric motor
94	Drill press
110	Power saw
147	Jet aircraft taking off

Noise that exceeds an average of 85 dBA over an 8-hour period is considered hazardous and may result in hearing loss. At 124 dBA, pain is likely to occur.

You may have been exposed to too much noise if you have:

- Trouble understanding normal conversation at work with someone 2 feet or 0.6 meters away.
- Prolonged ringing after leaving work.

- Trouble hearing speech after leaving work that clears up after a few hours off the job.

HEARING CONSERVATION PROGRAM

A hearing conservation program is required and is designed to protect workers with exposures from hearing impairment even if they are subject to such noise exposures over their entire working lifetimes.

The hearing conservation program should cover monitoring, audiometric testing, hearing protectors, training, and recordkeeping requirements.

MONITORING

Noise exposure levels should be monitored in a way that accurately identifies employees exposed to noise at or above 85 dBA averaged over 8 working hours, or an 8-hour time-weighted average (TWA). The exposure measurement must include all continuous, intermittent, and impulsive noise within an 80 dBA to 130 dBA range and must be taken during a typical work situation. Monitoring must be repeated when there is a change or controls increase noise exposure. Workers should be notified of the results of exposure monitoring.

Noise monitoring instruments must be carefully checked or calibrated to ensure that the measurements are accurate. Calibration procedures are unique to specific instruments. The manufacturers instructions should be followed to determine when and how extensively to calibrate the instrument.

AUDIOMETRIC TESTING

An audiometric testing program is required to monitor worker's hearing over time. The important elements of the program include baseline audiograms, annual audiograms, training, and followup procedures.

There are two types of audiograms required in the hearing conservation program:

- The BASELINE AUDIOGRAM is the reference audiogram against which future audiograms are compared. Baseline audiograms should be provided within 6 months of an employee's first exposure at or above an 8-hour TWA of 85 dBA. Employees should not be exposed to workplace noise for 14 hours before the baseline test or wear hearing protectors during this time period.
- ANNUAL AUDIOGRAMS are required within 1 year of the baseline. It is important to test workers' hearing annually to identify deterioration in their hearing ability as early as possible. This enables employers to initiate protective follow-up measures before hearing loss progresses.



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Employers must compare annual audiograms to baseline audiograms to determine whether the audiogram is valid and whether the employee has lost hearing ability.

NOISE CONTROLS

Noise controls are the first line of defense against excessive noise exposure. The use of these controls should aim to reduce the hazardous exposure to the point where the risk to hearing is eliminated or minimized. With the reduction of even a few decibels, the hazard to hearing is reduced, communication is improved, and noiserelated annoyance is reduced. There are several ways to control and reduce worker exposure to noise in a workplace.

- **ENGINEERING CONTROLS** involve modifying or replacing equipment, or making related physical changes at the noise source or along the transmission path to reduce the noise level at the worker's ear. Examples of inexpensive, effective engineering controls include:
 - Choosing low-noise tools and machinery.
 - Maintaining and lubricating machinery and equipment.
 - Placing a barrier between the noise source and employee.
 - Enclosing or isolating the noise source.
- **ADMINISTRATIVE CONTROLS** are changes in the workplace that reduce or eliminate the worker exposure to noise. Examples include:
 - Operating noisy machines during shifts when fewer people are exposed.
 - Limiting the amount of time a person spends at a noise source.
 - Providing quiet areas where workers can gain relief from hazardous noise sources.
 - Restricting worker presence to a suitable distance away from noisy equipment. By increasing the distance between the noise source and the worker, their exposure is reduced.
- **HEARING PROTECTION DEVICES** are considered an acceptable but less desirable option to control exposures to noise. There are three basic types of hearing protection:
 - Earplugs - reduce noise when properly fitted to the outer part of the ear canal. For comfort and protection, plugs must be the right size for a snug fit.
 - Canal Caps - close off the ear canals at the opening. The caps are made of a soft rubber-like substance; a light band under tension keeps them in position. They are a possible

choice for people who cannot wear earplugs and are preferred by those who must leave high noise areas frequently.

- Earmuffs – fit over the whole ear to seal out the noise.

HEARING PROTECTORS

All workers exposed to 8-hour TWA noise levels of 85 dBA or above are required to wear hearing protection devices. This ensures that workers have access to hearing protectors before they experience any hearing loss. Employees must wear hearing protectors:

- For any period exceeding 6 months from the time they are first exposed to 8-hour TWA noise levels of 85 dBA or above, until they receive their baseline audiograms.
- If they have incurred standard threshold shifts that demonstrate they are susceptible to noise.
- If they are exposed to noise over the permissible exposure limit of 90 dBA over an 8-hour TWA.

Workers should be provided with a selection of hearing protectors; at least one variety of both earmuffs and earplugs. They must adequately reduce the noise level for each employee's work environment. The Noise Reduction Rating (NRR), that represents the hearing protector's ability to reduce noise under ideal laboratory conditions, is commonly used. The NRR is adjusted to reflect noise reduction in the actual working environment. Typically, the higher the rating is, the better the protection.

Maintenance of hearing protectors is important. Wash reusable earplugs in warm soapy water after each use. Keep them clean, dry and in their carrying case when not used. Wet or dirty earplugs can cause serious ear infections.

TRAINING

Workers who understand the reasons for the hearing conservation programs and the need to protect their hearing will be more motivated to wear their protectors and take audiometric tests. Employees exposed to TWAs of 85 dBA and above are required, at least annually, to be trained in the effects of noise; the purpose, advantages, and disadvantages of various types of hearing protectors; and the purpose and procedures of audiometric testing.

RECORDKEEPING

Employers must keep noise exposure measurement records for 2 years and maintain records of audiometric test results for the duration of the affected employee's employment. Employers are also required to record work-related hearing loss cases when an employee's hearing test shows a marked decrease in overall hearing.



MINUTES OF MEETING

Date: _____ Person Conducting Meeting: _____

Topic: _____

Branch: _____ Division: _____

Attendees:

NAME	INITIAL	DATE

NAME	INITIAL	DATE

Additional Items Discussed:

Problem Areas or Concerns:

Comments:

FOR ENQUIRIES:

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