Noise and Hearing Conservation
Table of contents

Introduction ................................................................................................. 3
Noise and hearing conservation background ................................................ 3
Oregon OSHA administrative rules summary .............................................. 4
Instructions for various worker exposures ................................................. 5
Training program ....................................................................................... 6
Selection of hearing protectors ................................................................. 7
Recordkeeping .......................................................................................... 8
Resources .................................................................................................. 9
Appendix A: frequently asked questions ................................................. 10
Appendix B: hearing loss recordability flowchart ................................. 11

This publication provides practical loss control and safety information to assist you in making your workplace safer. It is not legal advice. SAIF Corporation has made every effort to bring significant Oregon Occupational Safety and Health Administration [OR-OSHA] regulations to your attention. Nonetheless, compliance with OR-OSHA remains your responsibility. You should read and understand all relevant OR-OSHA regulations that apply to your job site(s). You may want to consult with your own attorney regarding aspects of OR-OSHA that may affect you.

Note: The information in this publication is time sensitive. Do not rely upon this document if its publication date is more than three years old. Please check the Employer Guide “Safety” section of our web site at www.saif.com/safety for a more recent, printable copy. You’ll also find a variety of other valuable safety information designed to help your business prevent injuries and control costs.
Introduction

Employers with workplaces that have excessive levels of noise need to implement a comprehensive noise control program to help prevent their workers from suffering noise-induced hearing losses and to reduce workers’ compensation claims.

This resource will help you build a noise and hearing conservation program for continuous or steady-state noise, the most common cause of noise-induced hearing loss in workers. If your workplace has exposure to “impact” noise (when noise impulses occur at peak level in intervals), please contact SAIF’s Industrial Hygiene Section at 800.285.8525 for additional information.

Noise and hearing conservation overview

Whether noise produces a permanent loss of hearing in exposed workers depends on several factors:

- Loudness
- Exposure time
- Individual susceptibility to noise-induced hearing loss
- Presence of engineering controls

The more intense or loud the noise, the more likely it will contribute to hearing loss. The longer a worker is exposed to a particular noise, the greater the chance injury will occur to the auditory system.

The Oregon Occupational Safety and Health Division (Oregon OSHA) requires that employees have a workplace below the current eight-hour time-weighted average (TWA) of 90 decibels, measured on the A scale (dBA) with a slow response time. A hearing conservation program is required for employees exposed to an eight-hour TWA at, or above, 85 dBA. If workplace exposures reach or exceed an eight-hour TWA of 90, an employer must use one of the following methods of control to limit employee exposure to noise.

1. **Engineering controls**
   - Reduce noise by eliminating or enclosing the noise source, placing employees in sound-proof booths, installing sound-dampening materials, or purchasing less noisy machinery.

2. **Administrative controls**
   - Rotate employees from noisy areas to quieter areas so that the exposure time to high intensity noise is reduced.

3. **Personal protective equipment**
   - Require the use of appropriately selected hearing protection to reduce the amount of noise entering the employee’s ear.

Remember to follow the hierarchy of controls to the extent possible. Engineering controls are the most desirable method of controlling noise, followed by administrative controls, and the use of personal protection equipment (PPE) only as a last resort. This is because PPE, such as earplugs, may be worn incorrectly or not worn at all by employees, thus reducing the amount of protection they receive.
Oregon OSHA administrative rules summary

I. Noise exposure
The permissible noise exposure section requires engineering or administrative controls to reduce exposures exceeding 90 dBA for eight hours, 95 dBA for four hours, 100 dBA for two hours. The impulse or impact noise standard allows no sound level exceeding 140 dBA peak sound pressure level. Only noise levels at, or above, 90 dBA must be considered for controls.

II. Hearing conservation
An employer is required to institute a hearing conservation program whenever employee noise exposures equal, or exceed, an eight-hour TWA of 85 dBA, or a noise dose of 50 percent. This is known as the "action level."

The employer must monitor employees’ exposures to determine whether they exceed the eight-hour TWA of 85 dBA. The requirement for noise dosimetry includes all "continuous, intermittent and impulsive sound levels from 80 dBA to 130 dBA." The audiometric testing program requires that audiometric testing be provided to all employees whose exposure exceeds the 85 dBA TWA “action level.” The baseline audiogram must be provided within six months of placement in a job with high noise exposures. This audiogram should be preceded by at least 14 hours of quiet. The annual audiogram shall be obtained at any time during the work shift.

If the annual audiogram reveals a change in hearing threshold relative to the baseline audiogram of an average of 10 dBA or more at 2000, 3000, and 4000 Hz in either ear, the employee must be notified in writing within 21 days and additional follow-up is required. This change is called a “standard threshold shift.”

The area in which audiometric exams are conducted must be tested to show that background noise levels are low enough. The audiometer must be checked each day on a person whose hearing is stable. This is the daily, biological calibration. In addition, the audiometer must be acoustically calibrated at least annually.

Hearing protectors must be made available to all employees exposed above the 85 dBA TWA. The employer must enforce their use by employees who are exposed above 90 dBA (at 85 dBA, or above, for employees who experience a standard threshold shift). For those employees who do have a standard threshold shift, the hearing protector must also attenuate the noise level so that the calculated exposure of the inner ear is 85 dBA or below. For all other employees, the attenuation must only reduce the exposure to 90 dBA as an eight-hour TWA.

The attenuation factor or Noise Reduction Rating (NRR) is found on each package of protectors. To calculate the dBA attenuation, subtract seven from the NRR, and then subtract the remaining NRR from the noise level. Thus, if the noise level is 100 dBA, a NRR of 25 would reduce the exposure to 82 dBA.

The employer must provide a training program and repeat it annually.

The employer must keep records of exposure measurements, audiograms, audiometer calibration, and audiometric test area background noise.
Instructions for various worker exposures

Eight-hour average exposure below 85 dBA
(daily noise dose less than 50 percent)
1. No requirements
2. Recommend maintaining any records, sound level surveys, or audiometric test results which may have been conducted

Eight-hour average exposure of 85 to 90 dBA
(daily noise dose 50 to 100 percent)
1. Complete noise evaluation (records to be kept for two years)
2. Audiometric examinations annually
   a. Oregon OSHA requires records to be kept for length of employment. SAIF recommends maintaining these records indefinitely.
   b. Baseline test within six months of hire. SAIF recommends testing at hire date.
3. Have audiograms indicating hearing loss reviewed by a qualified specialist.
4. Refer employees with hearing loss to a qualified specialist at no cost to employee.
5. Make hearing protection devices available at no cost for all employees exposed above 85 dBA 8-hour average sound level.
6. Hearing protection use is mandatory for employees with a hearing loss. (Hearing protectors must have a noise reduction rating (NRR) sufficient to reduce the eight-hour average noise exposure to 85 dBA or below.) If no hearing loss is observed, hearing protection use is optional, however, SAIF highly recommends the use of hearing protectors for exposures between 85 and 90 dBA.
7. Employer must furnish a choice of two or more types of hearing protectors.
8. Employees must be trained in proper use of hearing protectors, purpose of audiometric testing, and effect of noise on hearing.
9. Noise standard and training materials must be made available to employees.

Average eight-hour exposure above 90 dBA
(daily noise dose greater than 100 percent)
1. All of the above requirements, plus the following:
2. Engineering or administrative controls to reduce noise to 90 dBA or below, if technically and economically “feasible”
3. Hearing protection use mandatory for all employees exposed to eight-hour average sound level of 90 dBA or greater
4. Hearing protectors must have an NRR sufficient to reduce the average noise exposure to 90 dBA or below.
Training program

Our sense of hearing is often taken for granted. It is only when we lose our hearing that we realize its importance to the quality of our lives. Unfortunately, much permanent damage can be done to our sense of hearing before we are aware of it.

How we hear
Sound waves move through the outer ear and set up vibrations in the middle ear. The vibrations are then transferred to the inner ear. The wave motion in the inner ear is sensed by cells which transmit neural messages to the brain.

Effects of noise on hearing
Prolonged exposure to excessive noise levels can cause a noise-induced hearing loss.

When you are exposed to excessive noise levels, the first effect usually is a temporary hearing loss. You may have difficulty in conversation or the ears may feel “plugged” and “ring.” Over a period of time, an individual who experiences repeated, temporary hearing loss will have gradual, permanent, irreversible hearing loss.

Noise-induced hearing loss involves damage to the receptor cells in the inner ear and is classified as sensorineural impairment. Loss of hearing typically begins with a drop in hearing level at the higher frequencies of sound. As the hearing loss increases, it includes the lower sound frequencies that include speech. Early noise-induced hearing loss normally is not detected by an individual, since it occurs above the speech range. By the time an individual is aware of a hearing loss, the amount of loss may be significant.

Audiometric testing
Audiometric testing is a means of determining your hearing ability. “Normal” hearing includes the median hearing level of a large group of American adults between 18 and 25 years of age, having no known history of ear disease and no appreciable high-level noise exposure. The accepted normal range of hearing is between 0 and 25 decibels. The audiometric test consists of exposing each ear separately to sound at six different frequencies. The audiometric test will indicate the amount of hearing loss, if any, of an individual. The higher the decibel reading, the greater the hearing loss.

Natural hearing loss takes place as an individual ages. This is called presbycusis. A cold, an ear infection, or recent high-noise exposure can cause a temporary hearing loss, which would produce poor test results.
You can help prevent noise-induced hearing loss by wearing personal protective equipment. There are three types of ear protectors: a muff which covers the entire ear, a plug which is inserted into the ear canal, and a “stopper,” or caps which cover the outer end of the ear canal.

*All three types of hearing protectors are designed to reduce the amount of noise reaching the inner ear.*

**Selection of ear protectors**

The reduction of noise by using hearing protectors is called attenuation. This is expressed in decibels. The manufacturer of each hearing protector will indicate the level of attenuation for each type of protector. It will be listed on the package as the noise reduction rating (NRR).

Ear protector selections should be based employee convenience, comfort, and proper degree of attenuation. Under-attenuating would lead to excessive noise exposure. Over-attenuating in moderate noise levels can lead to a feeling of isolation and, consequently, poor acceptance of the protectors.

**Fitting**

Earplugs must fit tightly to provide a good seal. Insert the earplug by grasping the ear with the opposite hand, pulling it up and out to open the ear canal, and then inserting the plug with the other hand. Muffs will normally fit all people without any difficulty. Eyeglasses may interfere with the proper fitting of the muff. Muffs that attach directly to hard hats are also available. Ear stoppers are usually easy to position. The headband can be worn on top of or behind the head, or under the chin. When hearing protectors are initially worn, it may take a short time for the employee to adjust to the new level of sounds. The same sounds are heard, but at a lower intensity.

**Care and use of ear protectors**

Ear protectors must be maintained in sanitary condition. It is important that earplugs be clean when inserted into the ears. If plugs are dirty when inserted, they may cause irritation, which could lead to infection of the ear canal. The same applies to stoppers. Earplugs, when not in use, should be stored in some type of container that can be closed to seal out dust or dirt. Earplugs should be replaced when they no longer can be cleaned or when they lose their pliability. Ear muffs have a replaceable seal which should be kept clean. The seal should be replaced whenever it becomes stiff or cracked.
Table 1: Types of hearing protection devices

<table>
<thead>
<tr>
<th>Type</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muffs</td>
<td>• Easy to fit in place and take on and off</td>
<td>• Cause pressure on the head</td>
</tr>
<tr>
<td></td>
<td>• Easy for management to monitor their use</td>
<td>• May not have a good seal with glasses or long hair</td>
</tr>
<tr>
<td></td>
<td>• Do not irritate the ear canal</td>
<td>• Are hot to wear in the summer</td>
</tr>
<tr>
<td>Inserts</td>
<td>• Inexpensive</td>
<td>• Difficulty in fitting (must fit tightly to be effective)</td>
</tr>
<tr>
<td></td>
<td>• More readily accepted by workers</td>
<td>• Tend to loosen with jaw movement</td>
</tr>
<tr>
<td></td>
<td>• Can be worn easily alongside other protective equipment (eyewear, hard hat, etc.)</td>
<td>• Can irritate ear canal</td>
</tr>
</tbody>
</table>

Recordkeeping

If you are required to keep the OSHA 300 Log (if unsure please refer to “OSHA Forms for Recording Work-Related Injuries and Illnesses” https://www.osha.gov/recordkeeping/RKform300pkg-fillable-enabled.pdf), note that there has been a change in the criteria for reporting occupational hearing loss. The work-related hearing loss must now be recorded on the log when: (1) An annual audiogram reveals a standard threshold shift in either or both ears; and (2) the hearing level in the same ear is 25 dB above audiometric zero.

A standard threshold shift is defined as an average of 10 dB or more at 2000, 3000, and 4000 Hertz in either ear. Prior to January 1, 2003, the requirement called for a log entry when the work-related shift was an average of 25dB or more. Ensure that your audiometric service provider is notifying you which cases are recordable based on the revised recordkeeping criteria.

The reporting requirements have allowances for age of the employee, retesting within 30 days of the first test, and input by a licensed health care professional. These allowances, along with the full requirements, are found in OAR 437-001-0700 (11), Recordkeeping and Reporting.
Resources

Oregon OSHA topic page: Noise
http://www.orosha.org/subjects/noise.html

Federal OSHA safety and health topics: Occupational noise exposure

CDC/NIOSH workplace safety and health topics: Noise and hearing loss prevention
http://www.cdc.gov/niosh/topics/noise/
Appendix A: frequently asked questions

Why does SAIF recommend wearing hearing protection for all employees exposed to between 85 and 90 dBA when Oregon OSHA requires it only for those with threshold shifts?

The Oregon OSHA codes for hearing protection are regulatory requirements. Employees may still experience hearing loss with long-term exposure between 85 and 90 dBA.

The code requires baseline audiograms within six months of an employee’s first exposure to noise above 85 dBA. Some employers, however, require audiograms as part of the hiring process. Why?

One reason is to document if hearing loss has occurred prior to employment with your firm. Oregon employers must be able to show that the “last injurious exposure” did not occur with them, or they may be responsible for hearing loss claims. If they wait six months to conduct an audiogram, then it may be difficult to know if the employee’s hearing loss arose, or if existing loss worsened, with the current employer rather than prior to being hired.

We provide annual audiograms after the baseline audiogram at time of hire.

Should we be monitoring noise levels on an annual basis, too?

Remonitoring should be conducted when there are significant changes in production, process, equipment, or controls that increase or decrease noise levels. This may be more or less often than every 12 months. Monitoring data can be used on a representative basis to determine which employees are to be included in your hearing conservation program.

Our company must implement a hearing conservation program. Does this mean we have to wear hearing protection from now on?

Not necessarily. Hearing protection should be the last resort of control measures. You should first look for ways to reduce noise through engineering or administrative controls. Often a relatively simple change can reduce noise by a significant amount. See page 2, for examples of each control.
We have access to a sound level meter. Can we rely on this instrument to determine if a hearing conservation program is required?

Following procedures in Appendix A of 1910.95, you could rely on a sound level meter to determine if a program is required.

However, area monitoring becomes inappropriate when there is high worker mobility, significant variations in sound level, or a significant component of impulse noise. In these cases, representative personal sampling (noise dosimetry) should be used.

I provide hearing protection for those required to wear it, but it is seldom worn. What is the employer’s responsibility in this regard?

Providing protection is not enough. Employers are required to ensure that hearing protection is worn when required. If wearing protection is a problem, management should find out why. Several areas to explore are the selection, fitting, and proper use of equipment. The employer should manage the wearing of hearing protection like every other aspect of their business.
Appendix B (nonmandatory) to 437-001-0700, hearing loss recordability flowchart

All numbers references below are taken as an average of the 2K, 3K, and 4K Hz levels of the audiogram

* 1910.95 assumes that any shift is workplace-induced unless a physician determines otherwise.

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 through 654.295.