University of Nevada, Reno

Hearing Conservation Program

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# HEARING CONSERVATION PROGRAM

*UNIVERSITY OF NEVADA, RENO*

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HEARING CONSERVATION PROGRAM

1.0 INTRODUCTION

1.1 Policy

It is the policy of the University of Nevada, Reno (UNR) to ensure safe and healthy learning, research, work, entertainment and student living environments for faculty, staff, students and visitors. Implicit in this policy is a requirement to provide all individuals with pertinent information about regarding noise hazards.

1.2 Purpose

The Hearing Conservation Program has been developed for University employees that potentially work in an areas with noise levels of 85 decibels or above, measured on the A scale (dBA) over a time weighted average of 8 hours. Employees that work in those areas must be placed in a hearing conservation program. This program will help ensure the safety and health of all employees at the University of Nevada, Reno.

1.3 Scope

University employees should wear hearing protection any time they are in an area that has noise levels at or above the action level, including areas posted as requiring hearing protection. As a general rule of thumb, hearing protection should be worn if a person must shout to be heard. Employees must always wear hearing protection when entering an area that has been posted as a noise hazard. Employees who are in the Hearing Conservation Program are required to use hearing protection when doing the jobs that produce noise at or above the action level and if they have experienced a threshold shift (which would be determined through annual audiometric testing). A variety of hearing protectors must be made available to the employee to ensure comfort and fit. The employer shall provide training in the proper use and care of all hearing protection devices. The affected employee’s department will provide suitable hearing protection and will replace it as necessary at no cost to the employee.
2.0 RESPONSIBILITIES

2.1 Directors and Department Managers

Designate individuals who must participate in and who will be responsible for the preparation and implementation of the Hearing Conservation Program.

Provide administrative and financial support for this program within individual departments.

Ensure the Hearing Conservation Program is implemented and maintained within the department.

2.2 Supervisors

Implement all aspects of this program, including documentation of the inspections and training. The supervisor has been designated this responsibility, as he/she is involved with employees on a more frequent basis.

Conduct hazard assessments and ensure that employees are informed, trained, and provided with the appropriate training.

Notify the Environmental Health & Safety Department of noise complaints, potential noise hazards, or employees which may have noise exposure approaching the action level.

Notify the Environmental Health and Safety Department of process, materials or equipment changes that may alter noise exposures.

Ensure that employees are provided with hearing protectors when required

Ensure that employees properly use and care for hearing protectors

Ensure that noise-hazardous equipment/areas are properly labeled or posted (greater than or equal to the action level)

Notify Environmental, Health and Safety of process, materials or equipment changes that may alter noise exposures

Ensure that potentially overexposed employees are provided with a baseline audiometric hearing test prior to the initial work assignment and then annually thereafter. High noise exposure must be avoided for 14 hours prior to an exam.

Enforce the use of hearing protectors or noise reduction procedures in the designated areas/assignments
Ensure new employee complete Hearing Conservation Program orientation/training and annual refresher Hearing Conservation Program training of employees is provided to all potentially overexposed personnel.

2.3 Employees

Comply with this program and any further safety recommendations provided by supervisors and/or the Environmental Health & Safety Department regarding the Hearing Conservation Program.

Conduct all assigned tasks in a safe manner including following required noise reduction procedures and the proper use of hearing protectors.

Store and maintain hearing protectors in a clean and sanitary manner.

Report any unsafe or unhealthy work conditions and job related injuries or illnesses to the supervisor immediately.

Store and maintain Hearing Conservation Devices in a clean and sanitary manner.

Report noise hazards and hearing protector problems to their supervisor

Attend required training sessions regarding the Hearing Conservation Program.

2.4 Department of Environmental Health and Safety (EH&S)

Provide technical information and assist departments in implementing an effective Hearing Conservation Program in their workplace.

Assist in providing Hearing Conservation Program instruction, as needed.

Review and revise the Hearing Conservation Program, as needed for compliance with applicable regulations.

Conduct noise assessment to determine if administrative and engineering controls are needed, and how they should be implemented

Identification of areas or processes that require noise abatement and/or posting

Evaluation and periodic re-evaluation of employees' exposure, by job classification, to determine which job titles need to be included in the Hearing Conservation Program

Recommend appropriate engineering controls, administrative controls and personal protective equipment.
3.0 HEARING CONSERVATION PROGRAM COMPONENTS

3.1 Noise Monitoring

If a potential noise problem exists, EH&S will conduct noise level monitoring at the request of the affected department. Results of the monitoring will assist in the selection of proper controls (engineering, administrative, and hearing protectors) and will identify employees that need to be placed in the Hearing Conservation Program. All employees with test results that measure at or above the action level will be notified in writing of the monitoring results and will be placed in the Hearing Conservation Program. Monitoring will be repeated when a change in production, process, equipment or controls increase noise exposures to the extent where: additional employees may be exposed at or above the exposure levels and the attenuation provided by hearing protectors may be deemed inadequate to meet requirements.

3.2 Audiometric Testing

A baseline audiogram conducted in accordance with OSHA requirements will be administered to employees who are placed in the Hearing Conservation Program. Employees will be advised that they should not be exposed to excessive noise for fourteen hours before the hearing test. A follow up audiogram will be done annually and compared with the baseline reading to identify a threshold shift. If a threshold shift has occurred, further evaluation and training may be necessary. The employee’s department will pay the costs involved.

3.3 Record Keeping

Noise monitoring records will be kept for at least two years by EH&S. Records from audiometric testing will be kept, at a minimum, for the duration of employee’s employment and will be kept confidential. These records will be made available to the employee upon request.

3.3 Choosing a Hearing Protector

Employees exposed to noise levels at or above an 8-hour TWA of 90 dBA shall wear hearing protectors. Employees exposed to noise levels at or above the action level of an 8-hour TWA of 85 dBA shall wear hearing protectors if they have experienced a documented standard threshold shift or have not obtained a baseline audiogram.

Hearing protectors shall be available to all employees exposed to noise levels at or above the action level of 85 dBA, 8-hr TWA, at no cost to the employees.
Employees shall be given the opportunity to select their hearing protectors from a variety of suitable types. Generally, this should include a minimum of two devices, representative of at least two different types.

Proper initial fitting and supervision of the correct use of hearing protectors shall be provided. Hearing protector attenuation shall be evaluated for the specific noise environments in which the protector will be used.

Hearing protectors must attenuate the noise level to an 8-hour TWA of 90 dBA or less. For employees who have experienced a standard threshold shift, the attenuation must reduce the sound level to an 8-hour TWA of 85 dBA or less. SEE APPENDIX I

Re-evaluation of hearing protectors shall be done whenever a workplace noise level increase renders the hearing protector's attenuation inadequate.

Workplaces in which the noise level exceeds the action level shall have signs posted.

Personal stereo headset or 'Walkman' is not approved for hearing protection.

Signs shall read "Hearing Protectors Required".

Choosing the right hearing protector depends upon several factors:

**Good seal**: sound reduction is dependent upon blocking any air leakage which will allow sound to bypass the hearing protector and enter the ear. For this reason, the hearing protector must fit properly whether over the ear or in the ear.

**Comfort**: Both comfort and conveniences are important if the device is to be used consistently. The ease of placing and removing the device.
4.0 TYPES OF HEARING PROTECTION

4.1 Expandable foam plugs

These plugs are made of a formable material designed to expand and conform to the shape of each person’s ear canal. Roll the expandable plugs into a thin, crease-free cylinder. Whether you roll plugs with thumb and fingers or across your palm doesn't matter. What's critical is the final result—a smooth tube thin enough so that about half the length will fit easily into your ear canal. Some individuals, especially women with small ear canals, have difficulty rolling typical plugs small enough to make them fit. A few manufacturers now offer a small size expandable plug.

4.2 Pre-molded, reusable plugs

Pre-molded plugs are made from silicone, plastic or rubber and are manufactured as either “one-size-fits-most” or are available in several sizes. Many pre-molded plugs are available in sizes for small, medium or large ear canals.

A critical tip about pre-molded plugs is that a person may need a different size plug for each ear. The plugs should seal the ear canal without being uncomfortable. This takes trial and error of the various sizes. Directions for fitting each model of pre-molded plug may differ slightly depending on how many flanges they have and how the tip is shaped. Insert this type of plug by reaching over your head with one hand to pull up on your ear. Then use your other hand to insert the plug with a gentle rocking motion until you have sealed the ear canal.

Advantages of pre-molded plugs are that they are relatively inexpensive, reusable, washable, convenient to carry, and come in a variety of sizes. Nearly everyone can find a plug that will be comfortable and effective. In dirty or dusty environments, you don't need to handle or roll the tips.

4.3 Canal caps

Canal caps often resemble earplugs on a flexible plastic or metal band. The earplug tips of a canal cap may be a formable or pre-molded material. Some have headbands that can be worn over the head, behind the neck or under the chin. Newer models have jointed bands increasing the ability to properly seal the earplug.

The main advantage canal caps offer is convenience. When it's quiet,
employees can leave the band hanging around their necks. They can quickly insert the plug tips when hazardous noise starts again. Some people find the pressure from the bands uncomfortable. Not all canal caps have tips that adequately block all types of noise. Generally, the canal caps tips that resemble stand-alone earplugs seem to block the most noise.

4.4 Earmuffs

Earmuffs come in many models designed to fit most people. They work to block out noise by completely covering the outer ear. Muffs can be "low profile" with small ear cups or large to hold extra materials for use in extreme noise. Some muffs also include electronic components to help users communicate or to block impulsive noises.

Workers who have heavy beards or sideburns or who wear glasses may find it difficult to get good protection from earmuffs. The hair and the temples of the glasses break the seal that the earmuff cushions make around the ear. For these workers, earplugs are best. Other potential drawbacks of earmuffs are that some people feel they can be hot and heavy in some environments.
5.0 TRAINING REQUIREMENTS

Annual training will be provided to all employees in the Hearing Conservation Program. Topics will include

- the effects of noise on hearing
- the purpose, advantages, disadvantages, and attenuation of various types of hearing protectors
- instruction of proper fitting and care of protectors
- the purpose and procedures of audiometric testing

The OSHA standard will be readily available to all employees on the EH&S website.
6.0 RECORDKEEPING

Noise monitoring records will be kept for at least two years by EH&S. Each department will maintain records of hearing protection training.

Records from audiometric testing will be kept, at a minimum, for the duration of employee’s employment and will be kept confidential.

These records will be made available to the employee upon request.
7.0 GLOSSARY

**Action Level:** An 8-hour time-weighted average of 85 decibels A-weighted (85 dBA 8-hr TWA) established by OSHA.

**Administrative Controls:** Methods that limit an employee’s exposure time to noise. This includes assigning the employee to less noisy areas in the workplace for a certain length of time so the employee shall not exceed the action level.

**Audiogram Testing:** Exams that measure the sensitivity of a person's hearing threshold in decibels as a function of frequency.

**Audiometer:** An instrument for measuring the threshold or sensitivity of hearing.

**Audiologist:** A professional specializing in the study and rehabilitation of hearing, who is certified by the American Speech-Language-Hearing Association or licensed by a state board of examiners.

**Baseline Audiogram:** An audiogram obtained after 14 hours of quiet. The audiogram will be the baseline against which future audiograms are compared.

**Continuous Noise:** Noise levels that vary with intervals of one second or less.

**Decibels (dB):** A measure of the sound level (loudness). The decibel scale is a logarithmic scale; as an example, a 90 dB noise is ten times louder than 80 dB noise.

**Decibels, A-Weighted (dBA):** The A weighted is the scale used for most occupational noise measurements. The A weighting approximates the range of human hearing by reducing the effects of lower and higher frequency noises with respect to the medium frequencies.

**Decibels, C-Weighted (dBC):** The C weighted scale filters include both high and low frequency noise and are used for impact noise and in the selection of hearing protection.

**Ear Muffs –** These devices fit against the head and enclose the entire external ears. The inside of the muff cup is lined with an acoustic foam which can reduce noise by as much as 15 to 30 decibels. Ear muffs are often used in conjunction with ear plugs to protect the employee from extremely loud noises, usually at or above 105 decibels.

**Ear Plugs -** Preformed ear plugs come in different sizes to fit different sizes of ear canals. Formable or foam ear plugs, if placed in the ear correctly, will expand to fill the ear canal and seal against the walls. This allows foam ear plugs to fit ear canals of different sizes.

**Engineering Controls:** May include purchasing quieter equipment using barriers, damping, isolating, muffling, installing noise adsorption material, mechanical isolation, variations in force, pressure or driving speed or any combination of methods to decrease noise levels.
**Frequency:** A sound's pitch measured in hertz (hz); high pitches are high frequency sounds.

**Hearing Conservation Program (HCP):** Program established when employees are exposed to noise exceeding the Action Level. Program must include noise surveys, audiometric testing, hearing protectors, training, and recordkeeping requirements.

**Hearing Protection Devices (HPD's):** Personal protective equipment that is designed to be worn in the ear canal or over the ear to reduce the sound level reaching the ear drum. Examples include ear muffs or plugs.

**Hearing Threshold Level (HTL):** The lowest threshold that the employee can hear the test tone during an audiometric test. The HTL's are recorded on the employee's audiogram.

**Hertz (Hz):** A unit of measurement of frequency, expressed as cycles per second.

**Impulse/Impact Noise:** Noise that is a sharp burst of sound, generally less than one-half second in duration, that does not repeat itself more than once per second.

**Noise:** Unwanted sound.

**Noise Dosimeter:** An instrument worn by an individual that integrates the sound level exposure over a period of time.

**Noise Reduction Rating (NRR):** The Noise Reduction Rating of hearing protection devices (HPD) indicates the theoretical amount of reduction of noise levels that can be achieved if the HPD is worn correctly. This rating is shown on the HPD packaging.

**Otolaryngologist:** A physician specializing in diagnosis and treatment of disorders of the ear, nose and throat.

**Permissible Exposure Limit (PEL):** 90 dBA 8-hour TWA. Employees may be exposed to 90 dBA for an 8 hour time weighted average (TWA) exposure without experiencing serious hearing effects.

**Pitch:** Another term for sound frequency. Higher pitches are higher frequency sounds.

**Representative Exposure:** Measurements of an employee's noise dose or 8-hour time weighted average sound level that is representative of the exposures of other employees in the workplace.

**Sound:** A vibration or pressure oscillation that is detectable by the ear drum.

**Sound Level Meter:** An instrument used for the measurement of noise in sound level surveys.
**Speech Interference Levels (SILs):** The frequencies most associated with speech, which are the 500-4000 hz (frequency) range. Vowels (a, e, i, o, u) are low frequency sounds (below 2000 hz) and consonants (b, c, d, etc) are high frequency sounds. The low frequencies are the least affected by noise. If the high frequencies are affected, t's and p's or s's and f's may be easily confused.

**Standard Threshold Shift (STS):** An average shift from the baseline measurement in either ear of 10 dB or more at 2000, 3000 and 4000 Hz. These frequencies are the most important frequencies in communication and the most sensitive to damage by industrial noise exposure. See Section 3.5 Stanford Risk Management for a definition of a OSHA reportable STS.

**Time-Weighted Average Sound Level (8-hr TWA):** That sound level, which if constant over an 8-hour exposure, would result in the same noise dose measured in an environment where noise level varies.

**Threshold of Pain:** A noise level of 120 dB causes pain.

**Permissible Exposure Limit (PEL):** 90 dBA TWA. Employees may be exposed to 90 dBA for an 8 hour time weighted average (TWA) exposure without experiencing serious hearing effects.

**Pitch:** Another term for sound frequency. Higher pitches are higher frequency sounds.

**Weighting Filters, Scales or Networks:** Sound level meters and dosimeters use a selective weighting system (filters) to eliminate certain frequencies from the measurements that are unimportant in the noise exposure.
APPENDIX I

- **Part Number:** 1910
- **Part Title:** Occupational Safety and Health Standards
- **Subpart:** G
- **Subpart Title:** Occupational Health and Environment Control
- **Standard Number:** 1910.95 App B
- **Title:** Methods for estimating the adequacy of hearing protector attenuation

This Appendix is Mandatory

For employees who have experienced a significant threshold shift, hearing protector attenuation must be sufficient to reduce employee exposure to a TWA of 85 dB. Employers must select one of the following methods by which to estimate the adequacy of hearing protector attenuation.

The most convenient method is the Noise Reduction Rating (NRR) developed by the Environmental Protection Agency (EPA). According to EPA regulation, the NRR must be shown on the hearing protector package. The NRR is then related to an individual worker's noise environment in order to assess the adequacy of the attenuation of a given hearing protector. This appendix describes four methods of using the NRR to determine whether a particular hearing protector provides adequate protection within a given exposure environment. Selection among the four procedures is dependent upon the employer's noise measuring instruments.

Instead of using the NRR, employers may evaluate the adequacy of hearing protector attenuation by using one of the three methods developed by the National Institute for Occupational Safety and Health (NIOSH), which are described in the "List of Personal Hearing Protectors and Attenuation Data," HEW Publication No. 76-120, 1975, pages 21-37. These methods are known as NIOSH methods No. 1, No. 2 and No. 3. The NRR described below is a simplification of NIOSH method No. 2. The most complex method is NIOSH method No. 1, which is probably the most accurate method since it uses the largest amount of spectral information from the individual employee's noise environment. As in the case of the NRR method described below, if one of the NIOSH methods is used, the selected method must be applied to an individual's noise environment to assess the adequacy of the attenuation. Employers should be careful to take a sufficient number of measurements in order to achieve a representative sample for each time segment.

NOTE: The employer must remember that calculated attenuation values reflect realistic values only to the extent that the protectors are properly fitted and worn.

When using the NRR to assess hearing protector adequacy, one of the following methods must be used:
(i) When using a dosimeter that is capable of C-weighted measurements:

(A) Obtain the employee's C-weighted dose for the entire workshift, and convert to TWA (see appendix A, II).

(B) Subtract the NRR from the C-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(ii) When using a dosimeter that is not capable of C-weighted measurements, the following method may be used:

(A) Convert the A-weighted dose to TWA (see appendix A).

(B) Subtract 7 dB from the NRR.

(C) Subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(iii) When using a sound level meter set to the A-weighting network:

(A) Obtain the employee's A-weighted TWA.

(B) Subtract 7 dB from the NRR, and subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(iv) When using a sound level meter set on the C-weighting network:

(A) Obtain a representative sample of the C-weighted sound levels in the employee's environment.

(B) Subtract the NRR from the C-weighted average sound level to obtain the estimated A-weighted TWA under the ear protector.

(v) When using area monitoring procedures and a sound level meter set to the A-weighing network:

(A) Obtain a representative sound level for the area in question.

(B) Subtract 7 dB from the NRR and subtract the remainder from the A-weighted sound level for that area.

(vi) When using area monitoring procedures and a sound level meter set to the C-weighting network:
(A) Obtain a representative sound level for the area in question.

(B) Subtract the NRR from the C-weighted sound level for that area.

**APPENDIX II**

<table>
<thead>
<tr>
<th>Duration per day, hours</th>
<th>Sound level dBA slow response</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>90</td>
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<tr>
<td>6</td>
<td>92</td>
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<tr>
<td>1</td>
<td>105</td>
</tr>
<tr>
<td>½</td>
<td>110</td>
</tr>
<tr>
<td>¼ or less</td>
<td>115</td>
</tr>
</tbody>
</table>

NOTE: When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: \( C_1/T_1 + C_2/T_2 \), where \( C_n \) indicates the total time of exposure at a specified noise level, and \( T_n \) indicates the total time of exposure permitted at that level, exceeds unity, then, the mixed exposure should be considered to exceed the limit value.

Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.