Hearing Conservation Program

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I. Purpose

The purpose of this program is to help protect University of Wyoming (UW) employees from hearing loss due to occupational noise exposure. Although UW attempts to control noise exposures on campus, certain operations and workstations may expose faculty, staff, or students to significant noise levels. This document is designed to comply with the Occupational Safety and Health Administration (OSHA) 29CFR 1910.95 entitled "Occupational Noise Exposure".

II. Applicable Regulations and Standards

State regulations:

- Chapter 7, Occupational Health and Environmental Control, Subpart G, 1910.95, Occupational noise exposure

Federal regulations:

- 29 CFR 1910.95: "Occupational Noise Exposure"

III. Definitions:

**Action Level**: An 8-hour time-weighted average (TWA) of 85 decibels A-weighted (85 dbA 8-hr TWA) established by WY-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. Future audiograms are compared to the baseline audiogram.

**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 an 80 dB noise.

**Decibels, A-Weighted (dBA)**: The A-weighted decibel level 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 is used for impact noise and in the selection of hearing protection.

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 of 85 dBA. Program includes 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 pressure reaching the ear. Examples include ear muffs or plugs.

Hearing Threshold Level (HTL): The lowest threshold that the employee can hear the test tone during an audiometric testing. The HTLs 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-hr TWA.

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 10dB 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.

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 in ear.

IV. Responsibilities

Department Heads, Managers, Supervisors, and Principal Investigators:

- Provide work environments that minimize noise to the greatest extent reasonable.
- Provide hearing protective devices for employees where needed.
- Request that EH&S evaluate noisy operations.
- Ensure that employees exposed to noise over the action level are given training and provided with audiometric exams and hearing protective devices.
- Provide easy access to hearing protective devices and ensure that employees use such devices where appropriate.
- Post areas known to present noise hazard and provide hearing protectors near entrance so people can have them prior to entering.
Faculty, Staff, Students, Visitors, and Guests:

- Wear approved hearing protective devices in posted noise hazard areas.
- Maintain hearing protectors in sanitary condition and proper working order.
- Report noise hazards and hearing protector problems to the appropriate supervisor.

Risk Management & Safety (RMSO)

- Monitor work sites for noise levels and inform employees and supervisors of results.
- Recommend appropriate engineering and administrative noise control measures.
- Assist employees in selection of proper protective devices and provide instruction on their use.

Audiometric Testing Contractor/Consultant

- Provide baseline, annual and post-employment audiometric exams.
- Communicate any identified standard threshold shifts to the employee and his or her supervisor.
- Provide information and training on noise hazards and hearing conservation.
- Establish any work restrictions necessary to prevent additional hearing loss.

V. Program Components

Who should be included in the program?

Employees who are routinely exposed to an eight-hour-time-weighted average of 85 dBA.

Departments/Locations with risk for elevated noise levels?


Agriculture Research Centers: Research and Extension locations (Powell, Lingle, Sheridan and Laramie)

Athletics: Athletics Facilities Group

Residence, Life, and Dining Services (RLDS): Facilities/grounds Group

Engineering: Labs and shops
Mechanical Engineering: Labs and Wind Tunnel
Arts and Sciences (A&S): Machine shop

Major Elements of the program

- Noise exposure assessments
- Audiometric testing
- Hearing protective equipment
- Employee awareness training
- Recordkeeping

A. Noise Exposure Assessments

Noise exposure is described either in terms of an 8-hour time-weighted average sound level or a noise dose (in percent at the 8-hour allowable exposure).

- Employee exposure to occupational noise should be maintained within the limits outlined in Table 1.
- When employee exposure to occupational noise is expected to equal or exceed an 8-hour time-weighted average of 85 dBA, or equivalently, a dose of 50 percent or greater, the employee must be included in an effective hearing conservation program as outlined in this document.

Exposure Monitoring

EH&S performs noise exposure monitoring of faculty, staff, and students who may be exposed to noise over Wyoming OSHA’s 85-decibel dBA action level on an eight-hour time-weighted average basis. Personal or area noise monitoring is conducted to identify employees and students for inclusion in the Hearing Conservation Program and to enable the proper selection of hearing protectors. Area noise monitoring is also used to identify campus locations where average noise levels exceed Wyoming OSHA’s 90 dBA permissible exposure limit. These are areas where hearing protection should always be worn.

B. Warning Signs

Warning signs indicating use of proper hearing protection will be posted at the entrance to work areas or on specific machines when permissible exposure limits are exceeded. Personnel who work in these areas, or with these machines will have hearing protection supplied to them. They will be instructed in how to use the protectors properly and to wear it in the identified areas.
Table 1: Permissible Noise Exposure

<table>
<thead>
<tr>
<th>Sound Pressure Level (dBA)</th>
<th>Duration Time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 (hazardous noise limit)</td>
<td>8.0</td>
</tr>
<tr>
<td>91</td>
<td>7.0</td>
</tr>
<tr>
<td>92</td>
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<td>93</td>
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<td>114</td>
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</tr>
<tr>
<td>115</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Employees or their supervisors should contact EH&S to schedule noise monitoring if they suspect exposures to excessive noise on the job, or if previously monitored noise levels may have changed due to modifications to equipment or processes. EH&S should also be contacted to schedule monitoring if the hearing protectors in use are suspected of being inadequate. If desired, employees or their representatives may observe the noise monitoring procedure by arranging with EH&S prior to the date of the monitoring. Evaluations of employee exposure are recorded and printed via the noise dosimeter. The report allows for the documentation of all necessary information including name of employee, job classification, employee number, date, location, and results of measurements, and description of the noise measurement equipment and calibration information. Persons whose noise exposures have been monitored may request written
notification of their exposure monitoring results from EH&S. Persons whose eight-hour time-weighted average noise exposure exceeds the action level will be enrolled in the Hearing Conservation Program.

These individuals will be offered audiometric testing, will have hearing protectors made available to them, and will be provided training on the fitting, use, and care of these devices. Additional monitoring of personal noise exposures should not be required unless a significant change is perceived in the workplace noise level.

C. Surveys

A preliminary noise survey consists of a “walk-through” using a sound level meter of facility areas of concern. A facility layout or grid of plan areas may be useful for recording noise levels and identifying areas that require further study.

While this study is intended to be an overview of noise exposure, consideration should be given to variations in noise levels due to shift changes, operation of noise-generating equipment, field operations or other factors that could affect baseline levels.

Where information indicates that employees in the area may be exposed to noise levels equal to or greater than 50 percent of the permissible exposure (e.g., 85 dBA over eight hours), more specific measurements should be obtained.

**Detailed Noise Survey**

The data gathered in the preliminary noise survey will determine which locations require more study. The detailed noise survey will:

- Use a noise dosimeter to provide specific information of the noise levels at individual work stations
- Evaluate time-weighted average employee exposure
- Define areas where noise exposure may exceed permissible levels and should be designated as a noise hazard area which requires the use of hearing protection
- Determine which employees should be included in the Hearing Conservation Program and receive audiometric testing and training.

In this study, measurements are recorded as close as practical to the employee’s workstation and approximated ear level.

D. Controls

Employee exposure to occupational noise is controlled as much as technologically and economically feasible by applying engineering principles that reduce noise levels. They may include:

- Quieter machinery
- Quieter processes
• Reduction of noise transmission
• Isolation of equipment or equipment operator
• Proper maintenance of machinery and equipment
• Purchasing procedures that specify criteria for maximum noise levels

Administrative controls may also be applied, when feasible. They may include:

• Rotation of employees to limit exposure times
• Flexible machinery operation schedules to limit exposures
• Work task arrangements that reduce the time an employee must spend in a noisy area

Where engineering and administrative controls are not feasible or during the evaluation and implementation of such controls, personal hearing protective equipment is used to protect employees from excessive noise exposure. This protection is provided as one part of an effective hearing conservation program.

E. Audiometric Testing

When an employee is enrolled in the UW Hearing Conservation Program, he or she must complete baseline, annual, and post-employment audiometric tests.

It is the responsibility of the supervisor of the identified department to schedule audiometric exams. Audiometric tests can be scheduled with the UW Communication Disorders Department in Health Sciences. The audiometric screening costs $25.00. Their contact number is 307-766-6426. The cost of the test is covered by the employee’s department and is free to the employee. Employees can choose to go to another doctor however, they will only be reimbursed up to $25.00 in costs.

To ensure accuracy the audiometric test should be preceded by at least 14 hours without exposure to workplace noise. This will reduce the potential for the employee to be suffering from a temporary threshold shift, which would result in an incorrect evaluation of the employee’s hearing threshold. Hearing protection may be used to provide the pre-test exposure control, providing its use is well supervised.

The UW Communication Disorders Department will maintain all audiometric testing records and will send a letter indicating whether a standard threshold shift has occurred to RMSO

Baseline Audiograms

Everyone enrolled in the Hearing Conservation Program must undergo testing to establish a baseline audiogram and to determine the person’s “hearing threshold” and against which to compare subsequent audiograms. It is desirable to obtain the baseline audiogram as soon as possible (preferably within 60 days) from the date of the employee’s first exposure to high noise levels.
Annual Audiogram

A new audiogram should be obtained at least annually for each employee exposed at or above the time-weighted average of 85 dBA. It is important to ensure that employees are protected from workplace noise prior to the audiometric test in order to obtain a valid measurement.

Post-Employment Audiogram

Post-employment audiograms must be completed when an employee leaves the job or workplace where he or she is no longer routinely exposed to noise level at or above an 8-hour time-weighted average of 85 dBA. It is the responsibility of the employee and the supervisor to complete a post-employment audiogram.

Evaluation of the Audiogram

An audiologist will evaluate audiometric test results and schedule any necessary follow-up evaluations.

Using the Occupational Safety and Health Administration’s (OSHA) criteria, a reviewer of audiograms will identify an STS if the hearing threshold has changed (relative to the baseline audiogram) an average of 10 dB or more at 2000, 3000, or 4000 Hz in either ear. Age corrections (listed in the appendix of the OSHA standard) may be used when determining STS, although they are not required.

According to ANSI S3.6-1969 a significant threshold shift is defined as an existing hearing shift of 25 dB or greater between 500 and 4000 Hz in either ear.

This information will be provided to EH&S so the appropriate hearing conservation and training activities can be initiated to reduce the potential for further hearing loss. The employee will be notified of these results in writing within 30 days. The employee will be retrained on the hazards and precautions of working in noisy environments and will be issued hearing protective devices if such equipment is deemed appropriate by EH&S and the medical provider. Other modifications to the workplace may be needed to reduce noise exposures to prevent additional hearing loss.

F. Hearing Protection

Campus departments must provide hearing protectors (usually earplugs or earmuffs) to all persons exposed at or above the 85 dBA action level. Hearing protectors must be free to the wearer and replaced when broken, defective, or unsanitary. A choice of at least two brands or types of hearing protectors must be available (Please refer to Appendix A for additional information about protectors.)

At UW, the use of hearing protectors is required:

- For all personnel exposed above the 85 dBA action level
- In all areas posted or otherwise designated as requiring hearing protection
A variety of suitable hearing protectors can be purchased, and employees will be given the opportunity to select their choice of hearing protectors. Employees should be informed of the locations where the use of hearing protective equipment is required. Appropriate warning signs should be posted.

A hearing protector's ability to reduce noise is measured as its Noise Reduction Rating (NRR). The greater the NRR, the better the noise attenuation (provided the earplug is properly inserted into the ear canal). EH&S can help determine appropriate types of hearing protectors for specific situations, and can provide training on the proper use of hearing protectors.

**Types of Hearing Protectors**

- **Aural (inserts):** Plug-type protectors that fit directly into the ear canal.
  - Pre-molded (sized or universal)
  - Moldable
  - Custom molded

- **Circumaural (muffs):** Plastic domes that cover the ears and are connected with a spring band that fits on top of the head.

- **Superaural (canal caps):** Caps that achieve sound attenuation by sealing the external opening to the ear canal.

It is the responsibility of managers, principal investigators, and supervisors to ensure that employees wear appropriate hearing protectors and that areas where noise levels are known to exceed 90 dBA have signs posted to alert visitors to the required use of hearing protectors.

**G. Employee Awareness and Training**

All employees should receive information regarding the Hearing Conservation Program through employee orientation, job training and instruction, specific training programs, and periodic safety committee meetings. The Human Resource Management System (HRMS) shall maintain training records.

Training topics include:

- Statistics on occupational hearing loss
- Basic concepts and terms relating to sound pressure level
- Anatomy of the ear
- Types of hearing loss
- Types of hearing protectors and proper usage
- Activities related to non-occupational hearing loss
- Elements of UW’s Hearing Conservation Program

Training is provided by EH&S and can be customized for work groups. Employees enrolled in the Hearing Conservation Program are required to attend annual training.
either in class or online.

H. Recordkeeping

Noise exposure measurement records are maintained by the occupational safety and health group within EH&S. Area noise data are retained for a minimum of two years and personal exposure data are retained indefinitely.

Audiometric test results are maintained by the employee’s department and should be retained for the duration of the person’s employment at UW.

Employees have the right to review records of their noise exposure data and audiometric tests. These records will be made available to employees upon request by EH&S.

VI. Important Links:

OSHA 1910.95: Occupational noise exposure

OSHA 1910.95 App A: Noise exposure computation (mandatory)

OSHA 1910.95 App B: Methods for estimating the adequacy of hearing protector attenuation (mandatory)

OSHA 1910.95 App C: Audiometric measuring instruments (mandatory)

OSHA 1910.95 App D: Audiometric test rooms (mandatory)

OSHA 1910.95 App E: Acoustic calibration of audiometer (mandatory)

OSHA 1910.95 App F: Calculation and application of age corrections to audiograms (non-mandatory)

OSHA 1910.95 App G: Monitoring noise levels non-mandatory informational appendix
OSHA 1910.95 App H: Availability of referenced documents (non-mandatory)

OSHA 1910.95 App I: Definitions
# Appendix A: Examples of Hearing Protectors and Related Costs

<table>
<thead>
<tr>
<th>Protector</th>
<th>Description</th>
<th>Cost and Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>QB2HYG Quiet Bank Reusable Hearing Protector, NRR 25</td>
<td><a href="http://www.northernsafety.com/Product/1493/Howard-Leight-QB2HYG-Quiet-Band-Reusable-Hearing-Protector-NRR-25">Link</a></td>
<td>$4.49 – $4.99 each</td>
</tr>
<tr>
<td>Ear Plugs, Howard Leight by Honeywell, NRR 33</td>
<td><a href="http://www.grainger.com/Grainger/disposable-ear-plugs/hearing-protection/safety/ecatalog/N-k2u?Ndr=basedimid10071&amp;sst=subset">Link</a></td>
<td>One box = $44.75</td>
</tr>
<tr>
<td>Ear Plugs, 3M, 33dB NRR</td>
<td><a href="http://www.grainger.com/Grainger/3M-Ear-Plugs-H0968?Pid=search">Link</a></td>
<td>Box has 200 = $45.00</td>
</tr>
</tbody>
</table>