

ENVIRONMENTAL HEALTH & SAFETY

UNIVERSITY *of* WASHINGTON

HEARING LOSS PREVENTION PROGRAM MANUAL

JUNE 2024



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PURPOSE

This document serves as the University of Washington's (UW) Hearing Loss Prevention Program Manual. The purpose of the Hearing Loss Prevention Program (HLPP or Program) is to establish requirements and procedures to ensure the safety of personnel through controlling exposure to noise levels that could result in occupational hearing loss. This document outlines the responsibilities of University units and departments, University personnel, and Environmental Health & Safety (EH&S) to protect personnel from work-related hearing loss.

The requirements in this manual meet the requirements of the [Washington Administrative Code \(WAC\) 296-817 Hearing Loss Prevention \(Noise\)](#), as required by the Washington Department of Labor and Industries (L&I) Division of Occupational Safety and Health (DOSH).

This document addresses the following:

- Defines the program's [scope](#), purpose, and [requirements](#)
- Describes procedures to minimize exposure to noise levels at or exceeding [exposure limits](#) and ensure personnel exposed to noise are protected
- Identifies personnel with exposure to elevated occupational noise levels who are required to participate in the Hearing Loss Prevention Program
- Describes [noise exposure](#), health effects of occupational hearing loss, [noise exposure assessments](#), [noise controls](#), and [audiometric testing](#)
- Describes the [responsibilities](#) of EH&S, the UW Speech and Hearing Clinic, units/departments, supervisors, and personnel participating in the Program
- Specifies [training](#) requirements and resources available for personnel participating in the Program
- Provides guidance on selecting feasible noise exposure [controls](#), quiet equipment, and appropriate [hearing protection](#)
- Assistance with [noise-reducing designs](#)

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SCOPE

The [Hearing Loss Prevention Program](#) applies to all University organizational units at all work locations including the Seattle, Bothell, and Tacoma campuses; UW Medicine medical centers and affiliated clinics; University owned property, University leased space, and temporary field locations under the control of University personnel.

University personnel are required to participate in the Hearing Loss Prevention Program if they (or a representative worker) have a full-day occupational noise exposure dose of 85 dBA or higher as an eight-hour time-weighted average (TWA₈).

Personnel in the following areas or performing the following job duties may be included in the Program. These areas or activities include, but are not limited to, the following:

Areas

- Sheet metal shops
- Mechanical rooms
- Machine shops
- Power Plant
- Animal care and use facilities
- Engine rooms on research vessels
- Areas with high pressure (or frequency) lab equipment

Activities

- Animal husbandry
- Aeronautics
- Operation of firearms
- Working with stationary or portable power tools
- Working near loud equipment
- Playing an instrument or listening to loud music
- Work with air compressors or with pneumatic-powered equipment
- Working near generators
- Heavy equipment operation
- Buildings and system maintenance
- Carpentry
- Grounds operations
- Construction
- Magnet quench

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ROLES AND RESPONSIBILITIES

Role	Responsibilities
<p>University unit, Department Administrators, Managers, Supervisors</p>	<p>The employing unit, department administrator, or designee as contact, has primary responsibility for ensuring personnel are properly protected against exposure to elevated noise in the work environment and for ensuring the requirements of the UW Hearing Loss Prevention Program are met within their units/departments including the following:</p> <ul style="list-style-type: none"> • Identify new and existing potential sources of noise exposure using the UW Job Hazard Analysis (JHA) template or an equivalent tool. Report to EH&S to have noise sources evaluated if there is a concern of elevated noise. • Reduce the level of noise from sources using engineering controls or purchase quieter equipment. Maintain equipment to minimize noise production. • Post signage in work areas that are designated as “high” noise exposure work areas and establish procedures to reduce noise exposure. Refer to the Signage section of this document. • Communicate noise exposure monitoring results to affected personnel within five (5) working days following receipt of an EH&S Report. • Ensure personnel participating in the Program (due to exposure to 85 dBA or greater TWA₈) are provided with audiometric testing. Ensure personnel receive baseline, annual, and termination or job transfer tests. Audiograms, including any required travel or necessary additional examinations or testing, are required to be provided at no cost to personnel in the Program. • Conduct hearing protection audits at least quarterly for temporary workers exposed to 85 dBA or greater TWA₈. • Provide a variety of hearing protection appropriate for the noise level at no cost to personnel. • Ensure personnel complete hearing conservation training initially (upon assignment) and annually thereafter. As needed, request assistance from EH&S for additional training on proper use of hearing protective devices and for hearing protective device fitting. • Inform personnel about site-specific noise hazards. Include information on sources of noise such as equipment or tools, available hearing protection and when to wear it, and when to report symptoms of hearing loss. • Ensure personnel use appropriate hearing protection when required. Replace any damaged hearing protection immediately.

Role	Responsibilities
	<ul style="list-style-type: none"> • Maintain a current list of personnel participating in the Program. Maintain records of noise exposure monitoring results, scheduled and attended audiometric tests, and training. Routinely notify EH&S of personnel departures and arrivals. • Conduct periodic self-audit to evaluate compliance with this program. • Ensure personnel report any work-related permanent hearing change in the UW Online Accident Reporting System (OARS).
<p>Environmental Health & Safety (EH&S)</p>	<p>EH&S administers the University's Hearing Loss Prevention Program, which includes providing compliance oversight and technical assistance to UW units, departments, and personnel, and is responsible for the following:</p> <p>Occupational Safety and Health (OSH)</p> <ul style="list-style-type: none"> • Administer the University-wide Hearing Loss Prevention Program and oversee compliance. • Develop a written program manual (this document), review the manual annually, and revise the program as appropriate. When responding to a Standard Threshold Shift (STS), identify and correct deficiencies in the Program. • Audit the University-wide Program periodically. • Conduct noise exposure monitoring and notify the unit/department of the results. Indicate when the noise levels exceed permissible standards established by DOSH and when personnel are required to participate in the Program. Provide guidance on other noise protection and hazard communication requirements. • Utilize and maintain (calibrate) noise dosimetry and sound level instrumentation in accordance with recognized standards and DOSH requirements. • Assist with noise-reducing design and quiet equipment selection. • Recommend and evaluate noise controls. • Review, select, and provide guidance on appropriate hearing protective devices; train personnel on their appropriate use. • Provide training on noise and hearing loss prevention that complies with regulations. • Provide follow-up evaluations after an STS. Evaluate employee noise exposure measurements, noise controls in the work area, and selection of hearing protection. Conduct additional noise monitoring if required. • Provide fit testing for hearing protective devices as needed.

Role	Responsibilities
	<ul style="list-style-type: none"> • Maintain a current list of personnel in the Program, audiometric tests, and training. • Maintain Program documents per the UW record retention schedule, including noise evaluation results. • Report recordable work-related permanent hearing changes (STS) on the OSHA 300 log. <p>UW Employee Health Center (EHC)</p> <ul style="list-style-type: none"> • Responsible for processing audiograms, notifying personnel of an STS, notifying OSH of need for follow-up evaluation, and scanning audiograms into the electronic patient records system (OHM). • Coordinate with the UW Speech and Hearing Clinic regarding an identified STS. • Send an STS notification letter to supervisors and personnel identified as having an STS after 30-day retest with indication of work-relatedness by the UW Speech and Hearing Clinic. • Copy OSH on any STS for OSH follow-up noise evaluation prior to 30-day retest. • Maintain health-related Program documents per the UW record retention schedule, including STS notifications and personnel audiograms.
<p>The UW Speech and Hearing Clinic</p>	<p>The UW Speech and Hearing Clinic, or other clinic that conducts audiometric tests, will provide the following:</p> <ul style="list-style-type: none"> • Conduct audiometric testing by a licensed audiologist, otolaryngologist (a physician specializing in diagnosis and treatment of disorders of the ear, nose, and throat), other qualified physician, or by a Council of Accreditation in Occupational Hearing Conservation (CAOHC) certified audiometric technician. Audiometric testing is required to be done at no cost to personnel. • Have audiograms reviewed by a licensed or certified audiologist, otolaryngologist, or other qualified physician or by a CAOHC certified technician responsible to a qualified reviewer. • Establish a baseline audiogram for personnel participating in the Hearing Loss Prevention Program. The baseline audiogram must be completed no more than 180 days from assignment. • Calibrate and maintain audiometric testing equipment as required. • Compare the annual audiogram to the baseline audiogram to identify an STS. Further evaluate personnel who show an STS. Complete audiogram report with a professional opinion on the work-relatedness of the STS. Inform personnel and EH&S (EHC) in writing within 21 calendar days of determination. Inform OSH

Role	Responsibilities
	<p>Accident Prevention Program (injury@uw.edu) of the STS determination to meet compliance with WAC 296-27-01113 Recording criteria for occupational hearing loss cases.</p> <ul style="list-style-type: none"> • Provide a final audiometric evaluation when personnel terminate their work in a position that required participation in the audiometric testing program.
Personnel/Employee	<p>Personnel who meet the criteria to participate in the Hearing Loss Prevention Program are responsible for the following:</p> <ul style="list-style-type: none"> • Participate in initial, annual, and termination audiometric tests as scheduled; receive 30-day follow-up audiogram when indicated; avoid noise exposure at the workplace and otherwise during the 14-hour period preceding the audiograms. • Follow unit/department safety procedures that address hearing loss prevention. • Participate in noise exposure monitoring when required. • Complete required training courses. • Wear appropriate hearing protection as required. Report damaged hearing protection devices to a supervisor immediately. • Report work conditions to a supervisor (or EH&S) that may result in high noise exposures so the hazard can be evaluated. • Report symptoms of hearing loss to a supervisor, such as incidents of ringing or buzzing in the ears. • Report work-related permanent hearing loss in the UW Online Accident Reporting System (OARS).

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NOISE EXPOSURE

The goal of evaluating noise exposure in the workplace is to prevent [occupational hearing loss](#) by controlling noise exposures that exceed regulatory [action levels](#).

NOISE MEASUREMENT

Noise levels are measured in decibels. The decibel scale is logarithmic, meaning it is not linear. This means a small change in the number of decibels results in a large change in the amount of noise and potential damage to a person’s hearing. This also means decibels produced by two sources cannot simply be added together to find the combined sound level.

There are multiple types of decibel scales. Noise levels are most commonly measured in decibels on the A-weighted scale (dBA), that reflects the sensitivity of the human ear as humans are less sensitive to very high and very low sound frequencies. The C-weighted scale (dBC) is more even across frequencies than the A-weighted scale.

The graph below shows that at 100 Hertz, the A-weighting network filters out approximately 20 dB from the incoming signal before it is combined with the levels from the other frequency ranges to produce an A-weighted sound level. On the A-weighting scale, at 1000 Hertz, nothing is subtracted.

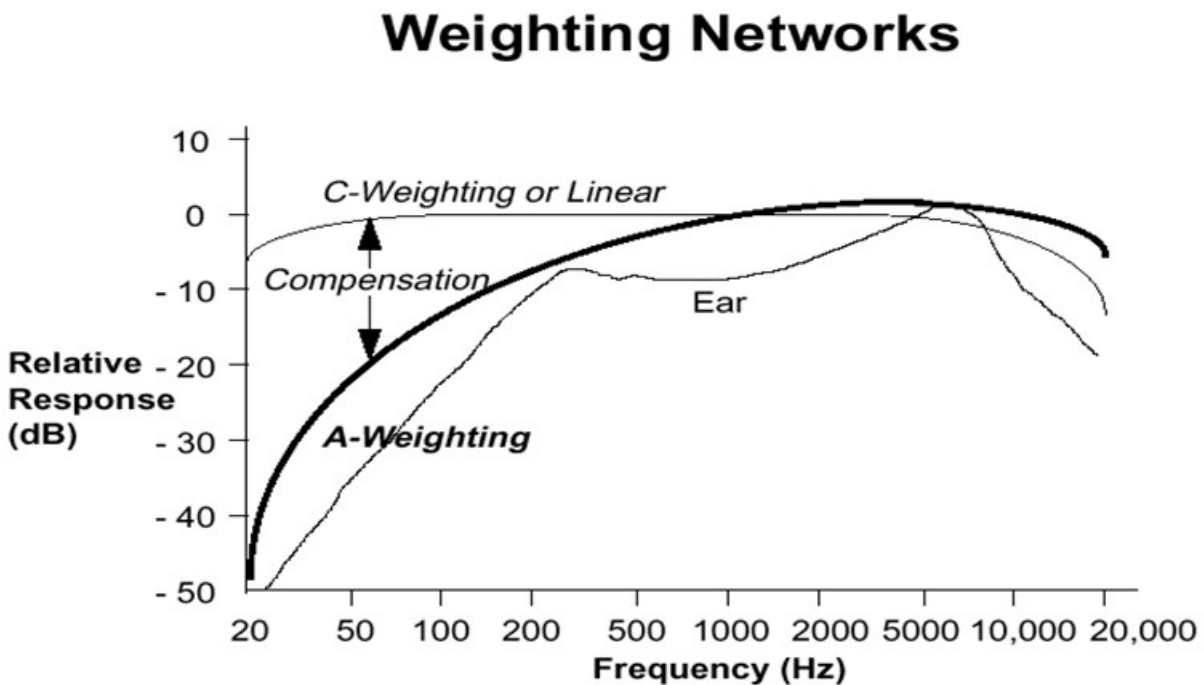


Figure 1. Source: www.nonoise.org/library/sndbasic/sndbasic.htm

NOISE EXPOSURE

There are multiple types of noise that people can be exposed to.

- **Continuous noise** is produced continuously with small fluctuations of level.
- **Intermittent noise** is more variable, being interrupted by intervals of relatively low sound levels.
- **Impulse/impact noise** is generally produced by rapid release of compressed gases or the collision of solid objects.

Both continuous and intermittent noise can be measured using slow response (measurements taken every one (1) second) because it smooths out rapid fluctuations in sound. On the other hand, impulse or impact noise is characterized by its instantaneous, short duration (less than one (1) second long) with a high peak followed by rapid decay. Impulse noise must be measured using fast response (measurements taken every 125 milliseconds) due to its short duration.

In addition to the type of noise, we must also consider the noise energy in relation to the amount of exposure time. In Washington state, the legal exchange rate is 5 A-weighted decibels (dBA). This means that when the noise level is increased by 5 dBA, the noise energy doubles, cutting the acceptable exposure time in half (Table 1).

Table 1. Allowable Noise Exposures, 5 dBA Exchange Rate (OSHA).

Duration per day (hours)	Sound level (dBA, slow response)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

For example, the allowable exposure time for noise levels of 90 dBA is 8-hours, while at 95 dBA it is halved to 4-hours.

NOISE EXPOSURE ASSESSMENTS

It is important to characterize noise hazards accurately, and to identify the activities and personnel affected by high levels of noise. Noise exposure assessments are performed by EH&S by conducting area monitoring and/or personal exposure monitoring. Assessments

are used to identify personnel whose exposure equals or exceeds the limits identified in Table 2.

Noise is considered “elevated” based on the intensity of the sound, how long the exposure lasts (duration), and how often the exposure is repeated (frequency). The intensity of the sound is measured using a sound level meter or dosimeter. Duration and frequency are based on qualitative data collected by EH&S.

EH&S conducts noise exposure assessments periodically and when:

- EH&S determines additional noise monitoring is needed;
- Whenever there is a change in conditions that may increase exposure; and
- Upon request.

Additional noise monitoring: EH&S may need to conduct monitoring on more than one day and/or use more than one method to get an accurate representation of noise exposure in a work area, or in response to [audiogram](#) results or an [incident report](#).

Change in conditions: Include, but are not limited to, adding machinery to a work area, increasing production rates, removal or deterioration of noise controls, increased use of noisy equipment, or changes in work schedules or job duties. Conditions that increase exposure can expose additional personnel and/or result in higher levels of noise. These changes in conditions require the unit to update the [Job Hazard Analysis \(JHA\)](#) and notify EH&S.

Upon request: Supervisors and units notify EH&S of new personnel and new work locations with potential noise hazards. Contact EH&S at (206) 543-7388 or ehsdept@uw.edu to request noise monitoring.

Area monitoring

Using a sound level meter, EH&S monitors the noise levels generated by equipment or in areas where noisy activities are being performed. The purpose of measuring sound levels is to identify the specific equipment or activity that is producing excess noise and identify the controls necessary to reduce personnel exposure to noise. Sound level meters can also help EH&S determine if additional noise monitoring is necessary, such as personal noise exposure monitoring using a noise dosimeter.

Another method of area monitoring is sound level mapping. Using a sound level meter, sound levels are recorded every few feet from noise-producing equipment in an area to determine where the noise level changes. The benefits of generating a sound level map are that you can identify the process or instrument of concern, define zones where hearing protection is required, and determine specific locations for noise mitigation or limited access. The average noise level is recorded in each location for at least 30 seconds and measurements are recorded on a drawing or facility map with equipment and worker locations. Sound level maps can also provide an estimate of personal exposure within a zone.

Personal exposure monitoring

A noise dosimeter is worn by an individual in compliance with [WAC 296-817-20005](#) and [WAC 296-817-30005](#) to collect an individual's 8-hour time-weighted average (TWA₈) noise exposure level. The TWA₈ value is compared to the Washington state action level limit of noise exposure of 85 dBA for an 8-hour period in Table 2.

Noise dosimeters integrate sound levels over time, including when sound levels are relatively low. This means that an individual with periodic exposure to elevated noise with times of non-elevated exposure may not have a TWA₈ above the legal action level limit of 85 dBA. Because a dosimeter captures noise variability throughout an individual's shift, these measurements are considered personal noise exposures. During personal exposure monitoring, the worker's activities are tracked and information such as time, location, noise-generating activities, and hearing protection worn is collected.

The results of the dosimetry study and information from the activity log are used to generate a noise exposure assessment and determine an individual's noise exposure level. Representative monitoring may be used where several personnel perform the same tasks in similar conditions.

Results

EH&S will provide the department/unit supervisor with the following:

1. Measurements of noise exposure levels
2. Notification that an individual's exposure equals or exceeds a threshold or action level that requires participation in the Hearing Loss Prevention Program
3. Recommendations for reducing noise exposure or implementing required noise controls (as appropriate)

Supervisors must share the results of noise exposure assessments with personnel within five (5) working days of receiving the result.

NOISE EXPOSURE ACTION LEVELS

The Washington State Department of Labor and Industries (L&I) established noise level thresholds for hearing loss prevention requirements to be implemented in the workplace as described in Washington Administrative Code (WAC) Section [296-817](#) and summarized in Table 2 below.

85 dBA full-day personal exposure

When the full-day personal exposure for one or more individuals equals or exceeds **85 dBA TWA₈**, units are required to:

1. Provide [hearing protection](#) for individuals exposed to 85 dBA TWA₈.
2. Require that individuals exposed to 85 dBA TWA₈ wear hearing protection.
3. Require the exposed individuals complete the EH&S [Hearing Conservation](#) online training initially and annually.

4. Schedule [audiometric testing](#) for each individual (initially, annually, and at separation or job transfer).

EH&S tracks individuals exposed to 85 dBA TWA₈ or above through the Hearing Loss Prevention Program.

Units are also required to provide hearing protection to personnel who do *not* have a full-day occupational noise exposure dose of 85 dBA or higher (TWA₈) but may be intermittently exposed for *less than 8 hours* to noise in areas where levels are 85 dBA or higher. These individuals are outside the scope of the Hearing Loss Prevention Program and are *not* required to complete training or participate in audiometric testing.

90 dBA full-day personal exposure

When the full day noise personal exposure for one or more individuals equals or exceeds **90 dBA TWA₈**, units must also implement [noise controls](#) (in addition to the requirements listed above).

115 dBA intermittent area exposure

When extreme noise level is measured at 115 dBA or above in an area where personnel are working (using slow response measurement, greater than one second in duration), the unit is required to:

1. Post [warning signs](#) in the area; and
2. Provide [hearing protection](#).

Personnel working in those areas who do *not* have a personal noise exposure over 85 dBA TWA for an 8-hour period:

1. Are required to use hearing protection; and
2. [Hearing Conservation training](#) is recommended initially and annually.

140 dBC impulse/impact area exposure

When extreme impulse or impact noise is measured at 140 dBC or above in an area where personnel are working (using fast response measurement, less than one second in duration):

1. The unit is required to provide [hearing protection](#); and
2. Personnel are required to use hearing protection.

Table 2. Noise Action Levels and Requirements Summary

Action level	Description	Requirements
85 dBA TWA₈	Full-day noise exposure equals or exceeds this level for one or more individuals	Training (initially and annually) Audiometric testing Hearing protection (provided and used)
90 dBA TWA₈	Full-day noise exposure equals or exceeds this level for one or more individuals	Training (initially and annually) Audiometric testing Hearing protection (provided and used) Noise controls
115 dBA	Extreme noise level in an area where personnel are working (greater than one second)	Hearing protection (provided and used) Post signage in work areas
140 dBC	Extreme impulse or impact noise in an area where personnel are working (less than one second)	Hearing protection (provided and used)

OTHER CONTRIBUTORS TO HEARING LOSS

[Ototoxic chemicals](#) can cause occupational hearing loss and make the ear more susceptible to noise-induced hearing damage. Personnel may be exposed to ototoxic chemicals through inhalation, absorption through the skin, or ingestion. For example, a person taking certain ototoxic drugs may lose hearing, become more susceptible to noise, or both.

Ototoxic chemicals (and examples) include:

- Solvents (styrene, trichloroethylene, toluene, xylene, ethylbenzene)
- Metals and compounds (mercury compounds, lead, organic tin compounds)
- Asphyxiants (carbon monoxide, hydrogen cyanide and its salts, tobacco smoke)
- Nitriles (3-butenenitrile, cis-2-pentenenitrile, acrylonitrile)
- Pharmaceuticals (certain antineoplastic agents and certain antibiotics)
- Certain pesticides

It is crucial to understand the specific hazards of chemicals used in the workplace and implement the appropriate controls to prevent exposure to ototoxic chemicals. Review the [safety data sheet](#) for each chemical, including the hazards, protective measures, and safety precautions for handling, storing, and transporting the chemical. If a safety data sheet states that a chemical is a neurotoxicant, it may be an ototoxicant. Contact EH&S for guidance on implementing chemical exposure controls.

In addition to noise exposure and ototoxic chemicals, individual factors such as age and smoking status can also affect an individual's hearing status.

NOISE CONTROLS

Units/departments are required to implement noise controls wherever personal noise exposure equals or exceeds 90 dBA TWA₈. Hearing protection is *not* considered a control; however, it provides a protective barrier to noise.

EH&S will provide noise control recommendations in the noise assessment and can evaluate noise controls upon request.

Types of controls

Elimination

When noise monitoring results indicate that workers are exposed to elevated noise levels, the best way to protect them is to eliminate the source of elevated noise.

EH&S recommends preventing hazardous noise and hearing loss by reviewing equipment and operations during the [design phase](#) prior to construction or remodeling of a facility. Refer to the [UW Facilities Design Standard](#).

Substitution

When elimination is not possible, substitution of loud equipment for quieter equipment is the next best alternative to protect workers from elevated noise.

Engineering controls

Engineering controls are used to eliminate noise at the source, isolate the noise source or personnel, or establish a permanent noise barrier.

Examples: Using sound-absorbing enclosures, silencers, or mufflers or placing a barrier between personnel and the noise source.

Administrative controls

If engineering controls are not feasible, units/departments can explore potential administrative controls that limit the number of personnel or amount of time personnel are exposed to noise. Because noise exposure is time-dependent, spending longer periods of time exposed to lower levels of noise can bring overall exposure down to acceptable levels.

Examples:

- *Scheduling work shifts to minimize exposure*
- *Rotating personnel performing loud tasks*
- *Limiting use of noisy equipment*
- *Rescheduling work*
- *Providing quiet and convenient lunch and break areas*

Personal protective equipment (PPE)

Hearing protectors are *not* considered noise controls. This is because small flaws in the [fitting](#) or [use](#) of hearing protection will significantly reduce its effectiveness.

HEARING PROTECTION

If, after implementing noise controls (as feasible or appropriate), noise exposure levels are *not* successfully reduced below 85 dBA TWA₈, affected personnel must wear hearing protection to reduce their exposure to noise.

Personnel are required to wear hearing protectors that provide adequate protection when:

1. Their personal noise exposure is equal to or greater than 85 dBA TWA₈;
2. Working in an area with short-term noise that equals or exceeds 115 dBA; or
3. Working in an area with instantaneous noise that equals or exceeds 140 dBC.

Selection

Supervisors and units/departments are required to:

1. Offer *at least two* [types of hearing protection](#) anytime personnel are exposed to noise that equals or exceeds 85 dBA; and
2. Ensure personnel use hearing protection.

Personnel must be provided with *at least two* distinct types of hearing protection. Select hearing protectors that consider personal comfort, environmental conditions, medical needs, and communication requirements. The noise reduction rating (NRR) must be adequate for the potential noise exposure.

Use the [Guidelines for PPE](#) for guidance on selecting hearing protection, or contact EH&S for consultation. EH&S provides consultation upon request for personnel whose workplace noise exposure levels require hearing protection devices to ensure proper fit and appropriate use.

Noise reduction rating (NRR)

The noise reduction rating (NRR) is a single-number, laboratory-derived rating that the U.S. Environmental Protection Agency (EPA) requires to be shown on the label of each hearing protector sold in the United States.

Units are required to use the derated NRR calculation to confirm the selected hearing protectors are adequate for the expected noise exposure. The derated NRR is an estimate of the actual protection provided by the hearing protectors in the workplace.

The derating method calculation (shown below and in Table 2 of [WAC 296-817-20015](#)) reduces the manufacturer NRR by 7 decibels. After calculating the derated NRR, subtract it from the daily dose noise exposure level (provided by EH&S in an [assessment](#)) to determine whether the hearing protectors will provide adequate protection.

Calculation for single hearing protection (earplugs, earcaps, or earmuffs)

$$\text{Manufacturer NRR} - 7\text{dB} = \text{Derated NRR}$$

$$\text{Noise exposure (dBA)} - \text{Derated NRR} = \text{Noise exposure with hearing protection (dBA)}$$

The value of “Noise exposure with hearing protection” must be **equal to or below 85 dBA** to provide adequate protection without [overprotection](#).

Example: Earplugs with NRR 20 can reduce noise exposure of 95 dBA TWA₈ to 82 dBA TWA₈, which is below the 85 dBA threshold for hearing protection.

$$20 \text{ NRR} - 7 \text{ dB} = 13 \text{ Derated NRR}$$

$$95 \text{ dBA} - 13 \text{ Derated NRR} = 82 \text{ dBA}$$

Exposures to 115 dBA or 140 dBC

Hearing protection with a manufacturer NRR of at **least 20 dB** must be used when exposed to noise at or above 115 dBA (slow response sound level meter) or 140 dBC (fast response sound level meter).

Hearing protection fit testing

Fit testing can help an individual decide which type and size of earplug provides the best level of protection and verify that the earplug is being worn correctly. EH&S can provide fit testing for earplugs upon request, or as a training tool when deemed necessary by EH&S such as in response to a standard threshold shift.

Dual hearing protection

Dual hearing protection is using both earplugs and earmuffs at the same time. Dual hearing protection should only be worn where noise levels exceed 115 dBA.

Simply adding the NRR levels of each type of protection together will *not* provide a dual protection level. Rather, when they are worn together properly, the effective NRR is 2 dB less than the higher NRR of the two.

Example: When wearing earplugs (NRR 23) and earmuffs (NRR 27), the dual protection level is $NRR 27 - 2\text{dB} = NRR 25$. If the noise exposure is 100 dBA, the exposure to the individual is reduced by 25 dB to 75 dBA when wearing both earplugs and earmuffs.

Overprotection

Overprotection can be a hazard when using hearing protectors reduces the noise level to a point that can hinder the ability to communicate or detect warning signals. Personnel should avoid using dual hearing protection or hearing protectors with an NRR that is too high for the environment, noise level, or the individual’s ability to hear.

Personnel having issues communicating or hearing warning signals should report these issues to their supervisor. Supervisors can [contact EH&S](#) as needed for consultation on selecting more appropriate hearing protection for the individual.

Using headphones for personal listening

Listening to headphones or earbuds may produce a safety hazard by masking environmental sounds that need to be heard, especially on active construction sites where attention to moving equipment, heavy machinery, vehicle traffic and safety warning signals

may be compromised. Listening to music also contributes to personal daily noise exposure, though the amount cannot be captured in a noise exposure assessment.

Personnel should keep the volume low if you are using headphones to listen to music at work and limit use to areas that are not noisy. Avoid using headphones in a way that creates a distraction or inhibits your ability to hear alarms or equipment.

Noise cancelling headphones are *not* a substitute for hearing protection.

Proper use

Hearing protection must be [used properly](#) to ensure adequate noise reduction. Supervisors must ensure personnel are using hearing protection properly.

1. Before use, hearing protection must be inspected for contamination or damage.
2. Ensure hands are clean before molding and inserting hearing protection.
3. Insert or apply hearing protection according to the manufacturer instructions or [training](#) provided by EH&S.
4. After use, throw away disposable or soiled hearing protection devices. Reusable devices should be cleaned (refer to manufacturer instructions), dried, and stored in a clean container.
5. Never share hearing protection that is inserted into the ear canal.

EH&S provides [training](#) for personnel using hearing protection that provides additional details on the use and care of hearing protection.

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TRAINING

EH&S HEARING CONSERVATION ONLINE TRAINING

Personnel with personal exposure limits equal to or greater than 85 dBA TWA₈ must complete initial (upon assignment) and annual [Hearing Conservation](#) training available on the EH&S website. The training includes:

- The effects of noise on hearing (including both occupational and non-occupational exposures);
- General noise controls used in a workplace;
- The purpose of hearing protectors (advantages, disadvantages, and attenuation of various types);
- Instructions for selecting, fitting, using, and caring for hearing protection; and
- Personnel's right to access records kept by the University.

SITE-SPECIFIC TRAINING

Units/departments are responsible for informing personnel of site-specific noise hazards. Include information on sources of noise such as equipment or tools, controls in place, and available hearing protection and when to wear it, and when to report [symptoms of hearing loss](#). The information provided must be consistent with changes in controls, hearing protection, and work processes.

TRAINING RECORDS

Completion [records](#) are available on EH&S website.

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AUDIOMETRIC EVALUATION AND MONITORING

All University personnel who have personal exposures to noise levels that equal to or exceed 85 dBA TWA₈ are required to participate in the University's audiometric testing program.

The [UW Speech & Hearing Clinic](#) (or other [qualified physician](#)) is responsible for administering the audiometric testing program in a manner that complies with the requirements of [WAC 296-817-400](#).

- ✓ **Units/departments are responsible for [scheduling](#) audiometric tests directly with the Clinic.**

The audiometric testing program is supervised by a licensed or certified audiologist, otolaryngologist, or other qualified physician who is responsible for reviewing audiograms. [Audiometric tests](#) are conducted by an audiologist, otolaryngologist, other qualified physician, or by a technician certified by the Council for Accreditation in Occupational Hearing Conservation (CAOHC) who is overseen by a qualified reviewer.

AUDIOMETRIC TESTS

Audiometric tests, including any required travel or necessary additional examinations or testing, are provided at no cost to the exposed personnel.

- Personnel must *not* be exposed to workplace noise for at least 14 hours before having an audiogram.
- Personnel should avoid being exposed to high noise levels from non-occupational noise sources (such as loud music, headphones, guns, power tools, motorcycles, etc.) during the 14-hour period immediately preceding the audiometric examination.
- ✓ **Units/departments are responsible for ensuring personnel attend their scheduled audiometric tests, including 30-day retests.**

Testing schedule:

- **Baseline:** Baseline audiometric tests are provided for personnel pre-placement, upon first assignment, or within 180 days of assignment to the noise-designated work area (as determined by an [assessment](#) by EH&S). When the baseline audiometric test reveals a pre-existing hearing loss, a [full evaluation](#) will be conducted to determine the type of hearing loss.
- **Annual:** Annual testing will be conducted following initial tests and will be compared to the baseline test results for all personnel who continue to work in a noise-designated area. Individuals identified as having an STS may be required to retest within 30 days of their annual audiogram.
- **At separation or job transfer:** Personnel who participate in the audiometric testing will have a termination hearing evaluation prior to separation from UW employment or upon transfer to duties with noise exposures below 85 dBA TWA₈. Supervisors

must ensure that personnel who terminate work in positions requiring hearing protection have final audiometric evaluations prior to their end date of employment or transfer to another duty without excessive noise exposure.

Audiograms will be reviewed by a licensed or certified audiologist, otolaryngologist, or other qualified physician. Personnel will be provided with the results of their individual audiometric exams with interpretations by the reviewer. The results of the audiometric test will be distributed by the Speech and Hearing Clinic to personnel and EH&S within one week.

Standard Threshold Shift (STS)

An STS is defined in the Occupational Safety & Health Administration (OSHA) occupational [noise exposure standard](#) as a change in hearing threshold, relative to the baseline audiogram for that worker, of an average of 10 decibels (dB) or more at 2000, 3000, and 4000 hertz (Hz) in one or both ears. An STS indicates that measurable noise-induced hearing loss may have occurred.

If an STS is identified

If an STS is identified, the worker is required to be retested within 30 days to confirm that the STS is persistent. Scheduling will be completed by the worker's unit/department to confirm the appointment is kept and completed within a 30-day timeframe.

In the event of an STS and prior to the 30-day retest, EH&S (EHC) will notify EH&S (OSH) of the need for noise exposure evaluation. The following actions will be taken by EH&S (OSH) if recent noise exposure data is unavailable:

- Determine if there has been a change in an individual's noise exposure, conduct monitoring, and document as appropriate.
- Evaluate and determine the likely source of noise exposure.
- Evaluate noise controls in the work area.
- Train personnel and assist in selecting and fitting the proper form of hearing protection.

If the results of the 30-day retest confirm a standard threshold shift is persistent (i.e., the hearing thresholds appear to have shifted out of the normal hearing range), a full evaluation will be conducted to determine the type of hearing loss and determine work-relatedness.

In some circumstances, an individual may return for a retest due to an STS and will be recommended for a full evaluation that is *not* required per the Audiometric Testing Program. In this case, the individual will be given the option to return to the Speech and Hearing Clinic for a full evaluation or will be advised to contact their personal care provider for a referral to audiology.

Work-related STS full evaluation

To determine if an STS is work-related, the audiologist needs personal noise exposure data and will ask a series of questions related to noise exposure at work, ototoxic chemical exposure, non-occupational noise exposure, and use of hearing protection during noise exposure.

The Speech and Hearing Clinic will submit a determination of work-relatedness to EH&S (EHC), EH&S Accident Prevention Program personnel (injury@uw.edu), and the individual.

If the cause of the STS is determined to be non-occupational, the Speech and Hearing Clinic determination letter will refer the individual to their own physician.

- The Speech and Hearing Clinic will refer the individual to an audiologist or ear, nose & throat specialist for further evaluation.
- The Speech and Hearing Clinic will inform the individual of a need for an ear exam if a medical cause unrelated to noise exposure is suspected.
- The individual will be advised to seek assistance from their personal physician for non-occupational illness.

If the STS is determined to be related to occupational exposure, EH&S (EHC) will notify the individual and EH&S (OSH) in writing within 21 days.

- EH&S (EHC) will also notify the individual of the option to file a claim for disability benefits. The individual must be notified of the time limitation (two years from the date of the notice) to file a claim per [RCW 51.28.055](#).
- An individual or their supervisor must report a work-related hearing loss in the [Online Accident Reporting System \(OARS\)](#).
- EH&S (OSH) will conduct an STS follow-up evaluation to address any deficiencies in the Hearing Loss Prevention Program.
- EH&S Accident Prevention Program personnel will record an identified STS case on the University's [OSHA 300 Log](#) (if it fits within the definition of a recordable injury).

OSHA recordability

If a worker's audiogram reveals that the worker has experienced a work-related STS in hearing in one or both ears, and the worker's total hearing level is 25 decibels (dB) or more above audiometric zero (averaged at 2000, 3000, and 4000 Hz) in the same ear(s) as the STS, the case must be recorded on the OSHA 300 log as a work-related injury/illness.

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HAZARD COMMUNICATION

SIGNAGE

Signage must be posted in areas where noise levels routinely equal or exceed 85 dBA. The signs must be clearly visible and contain the following information:

Post the **NOTICE** sign at the entrance to areas where noise exposure may exceed 85 dBA TWA₈.



Post the **CAUTION** sign near equipment that generates noise at or exceeding 85 dBA.

Post the **WARNING** sign in areas where noise exceeds 115 dBA, even intermittently.



NOTIFICATION TO PERSONNEL

All personnel who are potentially exposed to noise at or above 85 dBA over the 8-hour workday must be informed about the potential consequences of noise exposure and reminded of the methods of controls used to reduce exposure to noise at the worksite.

The unit/department must notify each individual whose exposure equals or exceeds 85 dBA TWA₈ of the monitoring assessment results within five (5) working days of when the results are available from EH&S.

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AUDITS AND INSPECTIONS

NOISE HAZARD ASSESSMENT

Identifying noise hazards involves recognizing any work process, activity, equipment, area, or situation that generates elevated noise with the potential to cause hearing loss.

Situations that may indicate elevated noise include:

- Noise in the workplace that interferes with people speaking, even at close range
- Information from the manufacturer of equipment that indicates high noise levels
- Reports from personnel of ringing in ears or temporary hearing loss
- Warning signals or alarms are difficult to hear
- Use of heavy machinery, fuel-powered tools, compressed air, etc.

The hazards must always be identified, risks assessed, and the proper controls put into place prior to starting work. The process of noise hazard identification, assessment, and control should be repeated when changes to work activities are planned or occur without prior notice.

Units and supervisors are required to assess noise hazards for specific work activities using the EH&S Job Hazard Analysis ([JHA template](#)) or an equivalent tool. A customized document can be developed to conduct and document a thorough assessment of noise hazards and determine the best controls for conducting the work. The JHA is required to be shared with personnel to inform them of their workplace hazards. It is also required to be updated anytime there is a new or changed process, including use of new machinery, equipment, or a newly implemented control.

If a noise hazard is identified in the JHA, noise levels are required to be evaluated by EH&S periodically or anytime there is a change in a process. If assistance is needed, JHAs can be sent to ehsdept@uw.edu.

SELF-AUDIT PROCESS

In order to ensure compliance, units/departments or supervisors with personnel participating in the Program or working in areas identified as a noise-designated area (by EH&S) must annually self-audit their compliance with the UW Hearing Loss Prevention Program using the form in [Appendix B](#). The form requires a review of your workspace, equipment, processes, and communication with personnel working in the space. Keep the completed form on file and provide the form to EH&S upon request.

TEMPORARY WORKERS

Temporary personnel are defined as individuals who work for a period less than one year and may include student employees.

Temporary personnel with noise exposures at or exceeding exposure limits are *not* required to have audiometric tests because they do not provide a useful measure as they may not capture small changes in hearing that may occur.

In place of audiometric tests, units/departments or supervisors of temporary personnel are required to conduct hearing protection audits in accordance with [WAC 296-817-50005](#), [WAC 296-817-50010](#), [WAC 296-817-50015](#), and [WAC 296-817-50020](#). Hearing protection audits have the following requirements:

1. Conduct hearing protection audits at least quarterly.
2. Document the audit, including:
 - The make and model of available hearing protection;
 - The size of hearing protectors;
 - The average noise exposure of the individual or representative personnel;
 - Any problems with the use of hearing protections; and
 - Any comments or complaints from the worker regarding the hearing protection.
3. Make sure personnel conducting the audits are properly trained and competent in the following areas: Evaluating hearing protection attenuation, evaluating hearing protector choices, and assessing the correct use of hearing protectors. The following resources are available;
 - Complete annual [Hearing Conservation](#) training;
 - Understand and use the derated [NRR](#) method to evaluate attenuation;
 - Follow PPE guidelines to select hearing protector choices;
 - Tips for selecting the right hearing protection;
 - Review instructions for appropriate use of hearing protectors;
 - EH&S is available to provide additional training on hearing protection auditing, hearing protection selection, and fit testing to confirm correct use.
4. Assess the hearing protection used by each individual during audits.

UW HEARING LOSS PREVENTION PROGRAM AUDIT

In order to identify and address deficiencies in the University's program, EH&S will conduct periodic audits of the University's Hearing Loss Prevention Program. The audit will generate a report that reviews the compliance requirements in the Washington Administrative Code (WAC) [296-817 Hearing Loss Prevention \(Noise\)](#) and evaluates the implementation by EH&S. Deficiencies will be identified and addressed through corrective actions in an improvement plan.

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RECORDKEEPING

Department	Type of Record	Record Retention Period
UW Department Administrator, Manager, or Supervisor	<ul style="list-style-type: none"> JHA (description of tasks that result in noise exposure ≥ 85 dBA and description of areas with noise ≥ 85 dBA and their noise source) List of personnel enrolled in HLPP, training records, attended audiogram, noise exposure monitoring records Record STS in OARS 	<ul style="list-style-type: none"> Maintain record as part of the permanent department/unit safety and personnel records
UW Speech and Hearing Clinic	<ul style="list-style-type: none"> Audiometric results Full audiometric evaluations when recommended 	<ul style="list-style-type: none"> Maintain in Speech and Hearing Clinic files Maintain for duration of employment at UW
UW EH&S Employee Health Center	<ul style="list-style-type: none"> Audiometric results STS notification Full audiometric evaluations 	<ul style="list-style-type: none"> Maintain in UW employee medical file Maintain for 30 years plus employment
UW EH&S Occupational Safety and Health	<ul style="list-style-type: none"> Noise exposure monitoring results and reports List of in HLPP participants, training records, attended audiogram records Unit/department audits HLPP audits Maintain STS incident reports and the OSHA 300 log 	<ul style="list-style-type: none"> Maintain in EH&S file for 30 years after creation Maintain in EH&S files for duration of employment at UW

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REFERENCES

The University of Washington Hearing Loss Prevention Program is designed to meet the Washington State Labor and Industries regulations, to protect all UW personnel from hearing loss.

Washington Department of Labor and Industries (L&I) Division of Occupational Safety and Health (DOSH). [WAC 296-817 Hearing Loss Prevention \(Noise\)](#)

Washington State Department of Labor and Industries (L&I) Safety and Health topics. [Noise](#).

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APPENDIX A: DEFINITIONS

Audiogram. A chart, graph, or table resulting from an audiometric test showing an individual's hearing threshold levels as a function of frequency.

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

Decibel (dB). Unit of measurement of sound level. A-weighting, adjusting for the sensitivity of the human ear, is indicated as "dBA." C-weighting, an even reading across the frequencies of human hearing, is indicated as "dBC."

Noise. Unwanted sound that is considered unpleasant, loud or disruptive to hearing.

Noise dose. The total noise exposure received by personnel during their shift. It can be expressed as a percentage indicating the ratio of exposure received to the noise exposure received in an 8-hour exposure to constant noise at 90 dBA. It may also be expressed as the sound level that would produce the equivalent exposure during an 8-hour period (TWA_8).

Noise dosimeter. An instrument that integrates a function of sound pressure over a period of time in such a manner that it directly indicates a noise dose.

Noise reduction rating (NRR). The NRR, which indicates a hearing protector's noise reduction capabilities, is a single-number rating that is required by law to be shown on the label of each hearing protector sold in the United States. Unit, dB.

Occupational hearing loss (OHL). A reduction in the ability of an individual to hear either caused or contributed to by noise exposure in the work environment.

Permanent threshold shift. A hearing level change that has become persistent and is not expected to improve.

Sound level. The intensity of noise as indicated by a sound level meter.

Sound level meter. An instrument that measures sound levels.

Standard threshold shift (STS). A hearing level change, relative to the baseline audiogram, of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear.

Temporary threshold shift. A hearing level change that improves. A temporary threshold shift may occur with exposure to noise and hearing will return to normal within a few days. Temporary threshold shifts can be indicators of exposures that lead to permanent hearing loss.

TWA_8 - Equivalent eight-hour time-weighted average sound level. The sound level, which if constant over an 8-hour period, would result in the same noise dose measured in an environment where the noise level varies.

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APPENDIX B: UNIT/DEPARTMENT SELF-AUDIT FORM

View the current version of the [Hearing Loss Prevention Self-Audit Form](#) on the EH&S website.

HEARING LOSS PREVENTION SELF-AUDIT FORM

Audit date:

Department/unit:

Name of manager/supervisor performing audit:

Purpose: The purpose of this form is for University units to audit their compliance with the [Hearing Loss Prevention Program](#).

Scope: This form applies if the unit has personnel enrolled in the Hearing Loss Prevention Program or has identified high noise areas that require signage.

Instructions: The audit will require an annual review of your workspace, processes, equipment, and communication with personnel working in the space. The completed form and any attachments should be kept on file and be provided to Environmental Health & Safety (EH&S) when requested.

NOISE EVALUATIONS

Question	Yes	No
1. Have you identified all potential noise hazards in your Job Hazard Analysis (JHA) ? If yes, please attach the job hazard analysis.		
2. Have there been any changes (new, modification, removal) to tools, procedures, or noise controls since the last noise evaluation conducted by EH&S?		
3. Have all noisy areas been evaluated by EH&S?		
4. Have all job titles exposed to noise been evaluated by EH&S in the last 3 years? <i>(Note: representative monitoring may be used where several personnel perform the same tasks in similar conditions, where one person is representative of a job title.)</i>		

PROGRAM ENROLLMENT

Question	Yes	No
5. Do you have a list of names of personnel enrolled in the Hearing Loss Prevention Program? If yes, please attach list of personnel. <i>(Note: personnel are enrolled in the program if they are exposed to ≥ 85 dBA TWA_{8h}.)</i>		

TRAINING

Question	Yes	No
6. Have personnel enrolled in the program completed their annual online hearing conservation training?		
7. Have you maintained training completion records? If yes, please attach the training records for all personnel enrolled in the Hearing Loss Prevention Program.		

AUDIOMETRIC TESTING

(skip to question 11 if only temporary personnel are enrolled)

Question	Yes	No
8. Have personnel been scheduled for their baseline, annual, or termination audiograms?		
9. Have scheduled employees attended their audiograms?		

Question	Yes	No
If yes, please attach list of personnel and attended audiogram dates.		
10. Have personnel who did not attend their scheduled audiogram been rescheduled?		
11. Have you conducted a hearing protection audit in place of audiometric testing? <i>(Note: hearing protection audits replace audiometric testing when enrolled personnel are temporary workers, defined as personnel who work for a period of less than one year.)</i>		

NOISE CONTROLS

Question	Yes	No
12. Are two distinct types of appropriate hearing protection available to personnel at no cost? If yes, please indicate brand, model, and NRR of available devices: Click or tap here to enter text.		
13. Have you inspected hearing protection for damage or soiling? If damaged or soiled hearing protection are identified, you must replace them.		
14. Have you ensured personnel are wearing hearing protection in areas when required?		
15. Are personnel wearing appropriate dual hearing protection where required? <i>(Note: dual hearing protection should only be worn where noise levels exceed 115 dBA.)</i>		
16. Are personnel properly wearing hearing protection?		
17. Are warning signs posted in required areas? <i>(Note: noise warning signs are required in areas where equipment produces noise over 115 dBA and in areas where hearing protection is required.)</i>		

Additional comments: