

# Hearing Conservation

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## University of Tennessee Safety Program IH-010

**Document Contact:** EHS-General Safety

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### Purpose

This program is designed to prevent hearing loss for students, staff and employees while engaged in university-sponsored activities.

### Scope and Applicability

This program shall apply to all employees, students and visitors to the University who are expected to be exposed to noise great enough to cause hearing damage. As a reference, 85 decibels, A-scale, (dBA) for an average of 8-hours per day shall be used. If octave band analysis is used to determine noise exposure, table G-9 in 29 CFR 1910.95 can be used. The provisions for audiometric testing and associated record keeping and training shall not apply to students or visitors. This program shall not apply to individuals attending events on campus for entertainment purposes.

### Abbreviations and Definitions

#### Abbreviations

**ANSI** – American National Standards Institute

**dBA** – decibels (A-scale)

**EHS** – Environmental Health and Safety

**NRR** – Noise reduction rating

**OSHA** – Occupational Safety and Health Administration

#### Definitions

**Action Level:** An 8-hour time weighted average (TWA) of 85 decibels measured on the A-weighted scale, slow response, or equivalently a dose of 50%.

**Weighted Sound Level (dBA):** The weighting of sound levels that represents the function of the human ear.

**Audiometric Testing Program:** The portion of the Hearing Conservation Program that consists of measuring an employee's hearing threshold to establish a baseline and for subsequent comparisons.

**Decibel (dB):** Unit of measurement of sound level.

**Dose:** A ratio of noise exposure relative to the noise criterion level of 90 decibels, expressed as a percentage. Ninety decibels represents a dose of 100% over an 8-hour work shift. Eighty-five decibels represents a dose of 50% over an 8-hour work shift.

**Hearing Protection Attenuation:** The estimated reduction in the noise level at the eardrum as a result of the use of hearing protection.

**Noise Induced Hearing Loss, NIHL:** The OSHA recordable occupationally related hearing loss, as defined by 29 CFR 1904.10 and 29 CFR 1904.5, and includes a Standard Threshold Shift (STS) of 10 db, with age correction, averaged over the 2K, 3K, and 4K frequencies from baseline in either ear and a 25 db shift from audiometric zero, in the same ear as the 10 dB STS at the same frequencies.

**Noise Reduction Rating (NRR):** The theoretical maximum amount of noise reduction that can be achieved using a hearing protection device. This is a manufacturers' calculated value and must be displayed with the hearing protection device.

**Monitoring:** The sampling of noise levels using a sound level meter, octave band analyzer, or personal noise dosimeter.

**Permissible Noise Exposure:** The maximum daily noise exposure which may be experienced by employees not using hearing protectors from a continuous 8-hour exposure to a sound level of 90 dBA or equivalent dose of 100%.

**Standard Threshold Shift (STS):** A change in hearing threshold, relative to the most recent audiogram for that employee, of an average of 10 decibels (dB) or more at 2000, 3000, and 4000 hertz in one or both ears and substantiated within 30 days with a follow-up audiogram.

**Time Weighted Average (TWA):** The [equivalent] noise level, in dB, based on an 8-hour exposure time frame. If the noise is not constant over an 8-hour exposure, then a calculated 8-hour TWA must be made using the equation in Table 1. The TWA may also be estimated from the dose or percent noise exposure, based on noise exposure continuous over 8-hours, as given in Table 2.

## Roles and Responsibilities

### University Administration shall provide:

1. Endorsement of the written plan.
2. Delegation of sufficient authority to the respective department heads involved to implement the plan.
3. Appropriate the necessary resources required to implement the plan.

### Supervisors shall:

1. Assure that the authorized individual(s) receive all necessary training to discharge their duties.
2. Assure that all equipment necessary to protect the health and safety of the workers are provided and maintained in a good state of repair.
3. Enforce the written control program.

### EHS shall:

1. Develop a written Noise Conservation policy and perform a periodic review to determine if revisions are necessary.
2. Monitor compliance of the respective departments' compliance with the Hearing Conservation Program.

3. Provide guidance and technical assistance to departments in the design and selection of appropriate engineering and administrative controls.
4. Provide guidance and technical assistance to departments in the selection of the most appropriate types and quantities of personal protective equipment.
5. Provide consultation to the departments to assist them in fulfilling their training needs.
6. Promote campus compliance with the OSHA Standard.
7. Provide a means by which employees can direct suggestions, complaints, and concerns regarding the campus Hearing Conservation Program.
8. Identify, evaluate, and make recommendations regarding those operations and locations requiring hearing protection.

#### **Employees shall:**

1. Participate willingly in all training programs offered by the University and learn as much as possible about the Hearing Conservation Program.
2. Abide by all rules and apply to the fullest extent possible the safety and health precautions specified by the University.
3. Report any problems that are observed, which could compromise health and safety, to the University administration through their immediate supervisor.
4. Maintain his or her hearing protection equipment in a safe and sanitary condition and use hearing protection as required.

### **Program elements**

#### **Determination of Noise Hazards and Monitoring**

EHS shall conduct periodic survey of the campus to identify equipment, processes and locations that generate substantial noise. Individuals exposed to noise levels exceeding an 8-hour, time-weighted average of 85 dBA shall be included in the Hearing Conservation Program. A sufficient number of measurements shall be taken to account for random fluctuations in employee noise exposure.

Sound level survey readings shall be taken to document the findings. In some cases, it may be necessary to use dosimetry to determine the individual's noise exposure.

Noise levels shall be checked (monitored) periodically. The frequency of monitoring shall be determined by EHS. Any individual in the University community may request a sound level survey.

#### **Impact Noise**

Impact or impulsive noise is defined as noise that reaches a maximum at an interval exceeding one second in duration. The maximum permit impact noise is 140 dBA. The following table shall be used to determine the permissible level of impact noise.

<b>Sound Level (dB)</b>	<b>Permitted Number of Impact or Impulses Per Day</b>
140	100
130	1000
120	10000

**Controls**

Personal protective equipment is considered the last choice with respect to controlling an employee's exposure to a noise source. This fact is based on low employee acceptable and improper use of personal protective equipment. It may be necessary to use several control methods in combination to assure workers' health. Hearing protectors may be used to prevent noise exposure while engineering or administrative controls are being developed. The following controls are arranged in descending order, with the first being the preferred method of control.

Engineering controls are the best choice, when feasible, for dealing with an occupational hazard. The first control to consider regarding a noise source is elimination of the source. Other engineering controls include equipment that produces lower sound level pressure, shielding or enclosure of equipment.

The second control method is known as administrative controls, which are also known as work practices. Examples of this control method involves rotation of workers, providing greater distance between the worker and the noise source, using less power or pressure to accomplish the task.

The third control method is personal protective equipment. Personal protective equipment can take the form of ear plugs, ear muffs, helmets or circumaural protectors. Some personal protective equipment uses active noise attenuation which is based on generation of a pressure wave that is 180 degrees out of phase with the noise source.

**Selection of Hearing Protectors**

The type(s) of hearing protection used by the employee shall reduce the sound level pressure to an 8-hour, time-weighted average of 85 dbA or less. All hearing protection has a noise reduction rating (NRR) which is expressed in decibels. These ratings were developed under laboratory conditions and do not represent actual use. The measurement of the effectiveness of the hearing protector varies based on whether the A-scale or C-scale is used and whether dosimetry or area exposures are measured. Consult EHS with regards to the field or adjusted NRR.

Employees shall be offered several different types of hearing protectors (e.g. plugs, muffs) that meet the necessary sound level attenuation.

**Care, Maintenance and Storage of Hearing Protectors**

Employee exposed to excessive noise shall be furnished with hearing protection. The University shall provide all necessary hearing protection at no cost to employees. Hearing protectors shall be inspected by the employee before each use for damaged, worn, or missing parts. Hearing protection devices shall be kept in good repair or replaced if unserviceable.

**Audiometric Testing**

Each employee exposed to noise levels in excess of 85 dbA (8-hour average) shall be offered an audiometric test. Employees shall be tested within six months of the date of their initial exposure to a time weighted average of 85 dbA or higher. Tests shall be preceded by at least 14 hours without exposure to noise (work or non-work related). Retesting shall be offered annually. All testing shall be offered the employee at no charge. The initial test shall serve as a baseline against which all subsequent tests are compared. The test shall be administered and reviewed by an individual(s) meeting the requirements set forth in 29 CFR 1910.95.

The effects of non-occupational noise exposure, age, disease, and drugs shall be considered during evaluation of the audiograms.

## Training and Information

### Employee Training

Employees shall be trained in hearing conservation. Refresher training shall be conducted on an annual basis. The following training requirements were taken from OSHA and ANSI and must be covered during training:

- a. Noise hazards and the effects on hearing.
- b. Engineering and administrative controls being used and the need for hearing protectors.
- c. Reasons for selecting a particular type of control.
- d. The function, capabilities, and limitations of the selected hearing protector.
- e. The proper fitting of the hearing protector.
- f. Maintenance, inspection, and storage of hearing protectors.
- g. The University's program for hearing conservation and
- h. The purpose of audiometric testing.

Acceptable sources of training include courses offered through Environmental Health and Safety, and other courses offered outside the University. Records shall be kept on employees who have been trained in the hearing conservation program.

## Recordkeeping

Listed below are various records that must be maintained under the hearing conservation program.

<i>Record</i>	<i>Location where record is</i>	<i>Minimum length of record</i>
Audiometric testing	Department	40 years
Employee training	Department	3 years
Medical opinion	Department	40 years
Sound level measurements –	EHS	10 years
Sound level meter calibration	EHS	3 years

The medical opinion and audiometric testing are considered medical records and shall be kept secure by the employee's department or by EHS.

Records may be kept in paper or electronic form.

### Employee Notification

Employees shall be notified, either verbally or in writing, when their noise exposure exceeds a time-weighted average of 85 dBA.

Each employee who has experienced a standard threshold shift shall be notified in writing within 21 days of the date of determination. A standard threshold shift shall be defined as an average hearing loss of 10 dBA at 2,000, 3,000, and 4,000 Hz.

### Off-site Noise Hazards

Members of the university community shall be covered by this plan when noise hazards are encountered off site. It shall be the responsibility of the dean, director, department head or immediate supervisor to identify

employees and students, under their supervision, who may be exposed to high noise levels. EHS is available to assist departments manage off-site hearing conservation programs.

Examples of such locations include hand gun certification for University police officers and graduate students' field practice in various industries.

## References

[OSHA General Industry - 29 CFR 1910.95](#)

## Appendices

Appendix A: Sound Level Survey – Field Worksheet

Appendix B: Noise Levels for Common Equipment

## Disclaimer

The information provided in these guidelines is designed for educational use only and is not a substitute for specific training or experience.

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## Appendix A: Sound Level Survey – Field Worksheet

Date	Results
Name of person being monitored	
Employee I.D. or Student User Name	
Job title	
Location of monitoring	
PPE used by employee	
Source of noise (equipment type)	
Impulse or continuous	
Person conducting monitoring	
Frequency of noise (if known)	
Indoor or outdoor noise	
Was a wind screen used	
Duration of exposure	
Instrument used	
Grab sample or integrated	
Calibrated before monitoring	
Time-weighted average	

**Comments**

## Appendix B:

### Noise Levels for Common Equipment

The following table can be used to determine if employees should participate in the University of Tennessee's Hearing Conservation Program (HCP). If an employee's use of equipment exceeds the allowable time more than two times per month, that employee needs to be included in the HCP. If an employee uses a piece of equipment that exceeds 85 decibels (dBA), regardless of duration, hearing protectors need to be used. The Noise Reduction Rating (NRR) needed for each piece of equipment is given. For equipment not listed, please contact EHS at 865-974-5084 for an evaluation.

<i>Noise Source</i>	<i>Sound Level</i>	<i>NRR Needed</i>	<i>Time Allowed</i>
Airboat	108 dBA	30	2 minutes
Band Saw	104 dBA	26	6 minutes
Blender	91 dBA	13	2 hours
Blower	99 dBA	21	19 minutes
Concrete Saw	112 dBA	34	1 minute
Chain Saw	110 dBA	32	1 ½ minutes
Combine operator	95 dBA	17	48 minutes
Compressed Air	92 dBA	14	1 hr. 35 minutes
Edger	86 dBA	8	6 hrs. 20 minutes
Fire Alarms	95 dBA	17	48 minutes
Front End Loader	95 dBA	17	48 minutes
Hedge Trimmer	103 dBA	25	7 ½ minutes
Juice Extractor	86 dBA	8	6 hrs. 20 minutes
Miter Saw	109 dBA	31	2 minutes
Plant Tissue Grinder	90 dBA	12	2 hrs. 30 minutes
Pneumatic Staking	103 dBA	25	7 ½ minutes
Pressure Washer	100 dBA	22	15 minutes
Radial Arm Saw	103 dBA	25	7 ½ minutes
Riding Lawn Mower	90 dBA	12	2 hrs. 30 minutes
Sprayer, 1,000 gal.	101 dBA	23	12 minutes
Table saw	93 dBA	15	1 hr. 16 minutes
Tractor	92 dBA	14	1 hr 35 minutes
Vacuum	87 dBA	7	5 hours
Weed trimmer	96 dBA	18	38 minutes
Wet/Dry-Vacuum	94 dBA	16	1 hour