



Campus Safety and Emergency Operations  
Office of Environmental Health and Safety

Walter J. Pinchbeck  
128 A Facilities Drive  
Pembroke, NC 28372

910-521-6792 Phone  
910-775-4772 Phone  
[safety@uncp.edu](mailto:safety@uncp.edu)  
[uncp.edu/safety](http://uncp.edu/safety)

# Hearing Conservation Program



Prepared by:  
Campus Safety and Emergency Operations  
Office of Environmental Health and Safety

Walter J. Pinchbeck  
128 A Facilities Drive  
Pembroke, NC 28372

910-521-6792 Phone  
910-775-4772 Phone  
[safety@uncp.edu](mailto:safety@uncp.edu)  
[uncp.edu/safety](http://uncp.edu/safety)

## Contents

Introduction.....	3
Scope .....	3
Responsibilities.....	4
Definitions.....	5
Identification of Noise Exposures.....	6
Nosie Monitoring.....	7
Program Participation .....	8
Noise Control Measures.....	9
Audiometric Testing.....	11
Threshold Shift .....	11
Training and Information .....	12
Signage .....	13
Recordkeeping .....	14
Table 1: Permissible Nosie Exposures.....	15
Guidance and Regulations .....	15

## Introduction

In compliance with the Occupational Safety and Health Administration (OSHA) Occupational Noise Exposure Standard ([29 CFR 1910.95](#)), the University of North Carolina at Pembroke shall take all precautions reasonable to protect employees from hazardous noise exposure in the workplace. OSHA identifies that a hazardous level of noise exposure is an eight hour time weighted average exposure of 85 decibels. Employers are required to administer a hearing conservation program when employee noise exposures exceed 85 dBs.

The objective of the University's Hearing Conservation Program is the identification and control of noise hazard areas and the recognition and protection of employees who have the potential to develop occupational noise-induced hearing loss.

## Scope

The University's Hearing Conservation Program applies to all university employees who work in noise hazard areas or who have the potential to develop noise induced hearing loss as a result of their occupation. This includes employees with measured or projected eight hour time weighted average noise exposures of 85 decibels or greater.

It is the intent of the university that, whenever practical or feasible, efforts to reduce or eliminate excessive noise exposure by means of engineering controls or proper work practices will precede a requirement for mandatory use of hearing protection.

The university's primary objective is to maintain noise levels in the work areas of its employees below 85 dBA using accepted engineering control methods. However, when this is not feasible, or while such controls are being instituted or evaluated, hearing protection shall be provided to employees who may be required to work in situations where noise exposures are potentially unhealthy. The maximum Permissible Noise Exposure Level for an eight hour time weighted average (TWA) is 90 dBA. Exposure to noise levels over 90 dBA are permissible for shorter periods of time as defined by Table 1.

The University Hearing Conservation Program includes:

- The assignment of responsibilities under the program;
- A description of elements of the program including: noise monitoring, program; participation, hearing protection, audiometric testing, training, and record keeping; and
- Appendices.

The University Hearing Conservation Program shall be reviewed at least annually by the Environmental Safety and Health (EHS) office and revised as necessary.

## Responsibilities

### Environmental Health and Safety Office

- Planning and recommending environmental, health, and safety programs which comply with all federal, state and local laws and regulations;
- Developing the Hearing Conservation Program;
- Working with administrators, supervisors and workers to implement the appropriate hearing conservation policies and practices;
- Monitoring procurement and the use of hearing protective devices;
- Conducting spot inspections to assure compliance with the Hearing Conservation Program;
- Conducting noise exposure surveys and maintaining resultant records;
- Knowing the current legal requirements concerning occupational noise exposure; and
- Annually reviewing the University's Hearing Conservation Program and determining ways to improve it.

### Manager

- Becoming familiar with the regulations and the University's Hearing Conservation Program;
- Ensuring compliance with this program; and
- Providing necessary resources including training and personal protective equipment for their employees.

### Supervisor

- Becoming familiar with the regulations and the University's Hearing Conservation Program;
- Ensuring that workers know and follow the Hearing Conservation Program rules, that protective equipment is available, in working order, stored properly, and that appropriate training has been provided;
- With the assistance of Environmental Health and Safety (EHS) Office, determining the required levels of protective equipment, ensuring its availability to personnel and enforcing its use; and
- Requesting assistance from EHS as needed.

### Employees

- Understanding and complying with University's policies and programs which pertain to his/her work, including the University's Hearing Conservation Program;
- Using appropriate personal protective equipment (PPE) as required by the operation being conducted;
- Refraining from the operation of any equipment without proper instruction; and
- Following both oral and written instructions from his/ her supervisor.

## Definitions

**A-weighted decibel:** The A-weighted decibel or dBA, is a type of decibel measurement which closely represents the manner in which a human ear responds to noise.

**Action level:** An 8-hour time-weighted average of 85 decibels measured on the A-scale, slow response, or equivalently, a dose of fifty percent.

**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-Language-Hearing Association or licensed by a state board of examiners.

**Audiometry:** A method of hearing assessment that tests an individual's ability to hear sounds of different intensities and frequencies. Audiometry detects early, asymptomatic noise induced hearing loss before the affected individual is even aware that it is happening.

**Baseline audiogram:** The audiogram against which future audiograms are compared.

**Criterion sound level:** A sound level of 90 decibels.

**Decibel (dB):** The decibel is a unit of measurement of sound pressure level that is a logarithmic and dimensionless.

**Hertz (Hz):** Unit of measurement of frequency, numerically equal to cycles per second.

**Noise:** In general, noise is considered to be any unwanted sound. The University's Hearing Conservation Program targets noise levels and noise exposures that are associated with noise induced hearing loss.

**Noise dose:** The ratio, expressed as a percentage, of (1) the time integral, over a stated time or event, of the 0.6 power of the measured SLOW exponential time-averaged, squared A-weighted sound pressure and (2) the product of the criterion duration (8 hours) and the 0.6 power of the squared sound pressure corresponding to the criterion sound level (90 dB).

**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 dosimetry:** This noise assessment technique measures an employee's personal noise exposure and is particularly useful and applicable when employees work in numerous noisy areas for short durations at a time or perform different noisy operations on any given day.

**Noise hazard area:** An area is considered a noise hazard area if the sound levels regularly exceed 85 dBA.

**Noise Survey:** Noise survey is another noise assessment technique that provides valuable information regarding sound levels in an area. The most common type is a general noise survey which measures sound levels in A-weighted decibels (dBA).

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

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

**Sound level:** Ten times the common logarithm of the ratio of the square of the measured A-weighted sound pressure to the square of the standard reference pressure of 20 micropascals. Unit: decibels (dB). For use with this regulation, SLOW time response, in accordance with ANSI S1.4-1971 (R1976), is required.

**Sound level meter:** An instrument for the measurement of sound level.

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

**Time-weighted average sound level:** That sound level, which if constant over an 8-hour exposure, would result in the same noise dose as is measured.

## Identification of Noise Exposures

In order to accurately identify employees who are at risk for noise induced hearing loss, workplace noise exposures need to be identified and evaluated. University employee noise exposures are influenced by multiple factors including work task (tools/equipment used), location, and duration. Some of the sources of noise exposures on campus include the following:

- Building Mechanical Equipment (HVAC equipment, fans, chillers, compressors, motors, pumps, emergency generators, etc.);
- Power Tools (located in academic shops and Facility Maintenance shops);
- Landscaping Equipment (typically used by the University Grounds Department);
- Construction equipment (typically used by University Construction Crew); and
- Research / testing equipment.

Department supervisors can request a sound level survey of an area or operation that may have excessive noise levels. Contact the EHS office at x 6792 to request a survey.

Noise surveys of locations on campus where background noise levels are thought to have the potential to exceed 85 decibels are conducted.

Locations where sound levels are above 85 dB are identified by area sound level surveys.

## Noise Monitoring

In order to effectively control exposure to high levels of noise it is necessary that the noise be accurately measured according to standard procedures, and that the measurements be properly evaluated against accepted criteria.

Noise-exposed employees and/or noise hazard areas will be identified by appropriate Department Managers or Supervisors in conjunction with the Environmental Health and Safety Office.

The monitoring of employees for noise exposure is made up of two parts, area and personal monitoring. Area measurements are generally obtained first. If noise levels approach or are above prescribed levels, personal monitoring using dosimeters may then be performed.

### Area Measurements:

In an area survey, measurements of noise levels are documented using a sound level meter to identify work areas where employees' exposures may be above hazardous levels requiring more thorough exposure monitoring. Area monitoring is conducted using a calibrated sound level meter set to the A scale, slow response. Within the area of interest, several different locations are typically measured. Measurement locations might include:

- In the hearing zone at the employee's normal work location;
- Next to the noise source(s);
- At the entrance(s) to the work area; and
- At other locations within the area where the employee might work.

If noise levels are below 80 dBA in the area, no further routine monitoring will be required for that area. Should any of the noise measurements equal or exceed 85 dBA, records shall be maintained as to the noise levels recorded, where they were taken, and the source(s) of the noise.

These records shall be updated periodically to determine if any changes have occurred that would warrant re-monitoring of exposed personnel. If any of the measurements approach or exceed a noise level of 85 dBA, employees who work in or near the high noise area or equipment may have their noise exposure determined through personnel monitoring using dosimeters.

### Personal Monitoring:

Determination of personal noise exposures will be accomplished using calibrated noise dosimeters. Employees monitored will have dosimeters placed on them at the beginning of their normal work shift with the microphone attached in the "hearing zone". The dosimeter will be worn for the full duration of the work shift while the employee performs a normal work routine.

At the end of the work shift, the dosimeter will be removed and information analyzed as soon as possible. Background information will be collected from each employee detailing job description, unusual job activities, etc., for the sample period. Those employees whose noise exposures equal or exceed 85 dBA as an 8-hour time-weighted average (TWA) will be identified to supervisors for enrollment into the Hearing Conservation Medical Surveillance Program.

#### **Re-monitoring of Hazardous Noise Area:**

All areas where noise levels approach or exceed 85 dBA shall be re-monitored periodically. Representative employees who work in high noise areas and whose 8-hour TWA approaches or exceeds 85 dBA will be monitored periodically to determine personal noise exposure for all similar employees.

Whenever an employee exhibits a standard threshold shift, as defined in the OSHA Occupational Noise Exposure Standard, re-monitoring will be conducted to attempt identification and correction of the cause.

#### **Re-monitoring Due to Changes:**

Any area with noise levels that approach or exceed 85 dBA, shall also be re-monitored whenever a change in production process, equipment, or controls increases the noise exposure such that additional employees are exposed to noise levels at or above 85 dBA on a time-weighted average basis. Areas where the noise levels have dropped below 80 dBA due to alterations in equipment, controls or process changes shall be eliminated from the monitoring program.

The Environmental Health and Safety (EHS) office shall provide copies of personal exposure monitoring results to all monitored employees through supervision. Department management will be provided a report that summarizes monitoring in areas under their control. EHS shall permit affected employees or their representatives an opportunity to observe any noise measurements conducted.

### **Program Participation**

When an employee of the university is exposed to sound levels at or above the OSHA defined action level of 85 dBA (8 hour TWA) they shall be required to participate in the University Hearing Conservation Program.

## Noise Control Measures

Where employee noise exposures can exceed 85 dBA, appropriate noise control strategies are developed and implemented. Control strategies will include engineering controls, administrative controls, and personal protective equipment (hearing protective devices).

### Engineering Controls:

Noise levels are to be reduced through engineering controls where feasible or practical. Engineering controls may include barriers, vibration damping, source isolation, and sound absorbing enclosures. When new equipment is purchased, consideration shall be given to the noise levels generated and the potential exposure of employees working with or near the equipment.

### Administrative Controls:

Where engineering controls are not practical or feasible, administrative controls must be considered. Administrative controls include: changes in work procedure, rescheduling of the noisy activity, or decreasing the duration of exposure through rotation of workers.

Clearly visible warning signs must be posted at the approaches to an area where sound levels regularly exceed 85 dBA. These warning signs must clearly indicate that the use of hearing protection is mandatory.

Where a piece of equipment or tool presents the noise hazard operator training and/or labels affixed to the equipment shall be used to reinforce the requirement for hearing protection while operating the equipment.

Regular equipment maintenance can be an important noise control measure since well-maintained equipment, can be quieter.

### Personal Protective Equipment (Hearing Protective Devices):

Where engineering and /or administrative controls are not feasible, hearing protective devices must be used where sound levels regularly exceed 85 dBA or where an individual's personal exposure may exceed the limits set in Table 1.

Hearing Protective Devices include earplugs and ear muffs. A variety of styles are available.

Hearing Protective Devices shall be made available to all program participants. Supervisors of affected employees shall maintain a selection of Hearing Protective Devices, accessible to all program participants. At the discretion of the supervisor, ear muffs may also be provided to program participants. Ear muffs are suggested where the use of hearing protection will be intermittent over the course of the work shift. Ear muffs will not be shared between workers and will be individually assigned.

Supervisors may contact EHS for assistance in the selection, proper use, and/or procurement of hearing protective devices.

The life of the hearing protector is dependent on the care it is given. A sponge type hearing protector is disposable. But as long as it is clean, it may be used until it no longer expands. How long the hearing protection lasts is unique to each employee depending on the makeup of their body.

Typical life of hearing protectors:

Type	Length of Use	Type	Length of Use
Sponge Plugs	Single Use	Custom Plugs	18-24 months
Insert Plugs	4-6 months	Muffs	Replace when worn

### Hearing Protection Selection:

Hearing Protective devices are selected based on their ability to reduce the sound level exposure to below 85 dBA. One way hearing protective devices are evaluated/selected is based on their Noise Reduction Rating (NRR) developed by the Environmental Protection Agency (EPA). See Figure 1 below for an example of a Noise Reduction Rating label.



The NRR describes the average sound level reduction (attenuation) provided by a hearing protection device (HPD) in a laboratory test. Since the NRR is based on laboratory testing, it does not take into account the loss of protection that occurs

when hearing protectors are not fit properly or when they are not worn for the entire time that the wearer is exposed to noise.

Hearing protector attenuation shall be evaluated by EHS for the specific noise environments in which the protectors will be used. Hearing protectors must be selected which attenuate employee exposure at least to an 8 hour time-weighted average of 90 decibels. Re-assessment of attenuation will be performed as needed for changes in noise environment or hearing protectors.

## Audiometric Testing

The university maintains an audiometric testing program, coordinated by EHS. All employees who are exposed to sound levels at or above the action level

of 85 dBA (8 hour TWA) shall receive audiometric testing. This program shall be provided at no cost to employees. The university will select an outside vendor to provide this service. Baseline audiometric testing shall be performed upon identification of an employee as a program participant and within 6 months of initial exposure to the action level of 85 dBA (8 hour TWA). Audiometric testing shall be repeated annually thereafter.

Audiometric test requirements shall meet those outlined in section (h) of the OSHA Occupational Noise Exposure Standard ([29CFR 1910.95](#)).

It is required that the baseline audiogram be preceded by at least 14 hours without exposure to workplace noise. Time that hearing protection is worn may be included as part of the 14 hours without exposure to noise. Employees shall be notified that they need to avoid non-occupational noise exposure during the 14 hours prior to the audiometric test. This notification shall be documented.

A retest audiogram may be conducted to verify or confirm a hearing threshold result. Times when a retest may be needed:

- If an employee has suffered a Standard Threshold Shift, the employer may obtain a retest within 30 days and use the results of the retest as the annual audiogram;
- The Audiologist or Physician can request a retest to confirm test results; and
- When problems are suspected by the test administrator.

## Threshold Shift

Each employee's annual audiogram shall be compared to that employee's baseline audiogram to determine if the audiogram is valid and if a standard threshold shift (STS) as defined by the OSHA Occupational Noise Exposure standard has occurred.

If the annual audiogram shows that an employee has suffered a standard threshold shift, the university may coordinate a retest of the employee within 30 days and consider the results of the retest as the annual audiogram. The employee will be

notified of the standard threshold shift within 21 days of the determination. The audiologist, otolaryngologist, or physician shall review problem audiograms and shall determine whether there is a need for further evaluation.

Unless a physician determines that the standard threshold shift is not work related or aggravated by occupational noise exposure, the university will take the following steps when a standard threshold shift occurs:

1. Employees not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them;
2. Employees already using hearing protectors shall be refitted, and retrained in the use of hearing protectors, and provided with hearing protectors offering greater attenuation if necessary; and
3. The employee shall be referred for a clinical audiological evaluation or an otological examination, as appropriate, if additional testing is necessary or if the employer suspects that a medical pathology of the ear is caused or aggravated by the wearing of hearing protectors.

Revised baseline - An annual audiogram may be substituted for the baseline audiogram when, in the judgment of the audiologist, otolaryngologist, or physician who is evaluating the audiogram:

1. The standard threshold shift revealed by the audiogram is persistent; or
2. The hearing threshold shown in the annual audiogram indicates significant improvement over the baseline audiogram.

## Training and Information

New employees hired into positions with documented noise exposures > 85 dB will receive initial hearing conservation training conducted by Department supervisor, authorized vendor, or by the EHS office. The content will be the same as the annual training (listed below).

EHS or the audiometric testing contractor shall conduct annual hearing conservation training for all affected employees. The training will include:

1. The effects of noise on hearing;
2. The purpose of hearing protectors; the advantages, disadvantages and attenuation of various types;
3. Instructions on the selection, fitting, care and use of hearing protectors; and
4. The purpose of audiometric testing, and an explanation of the test procedures.

Written information will be provided to program participants regarding this program and the Occupational Noise Exposure standard [29 CFR 1910.95](#). A copy of the

standard shall be posted in the workplace (FM Grounds Department break room). Additional copies of the standard are available from EHS.

### Signage

Signs are to be posted at access points to noise hazard areas to inform employees of the need or recommendation for use of hearing protection.

Locations that are infrequently occupied where operating mechanical equipment produces noise levels at or over 85 dBA (e.g., mechanical rooms) will be posted with the following 7" X 10" sign:



Signs can be obtained from [My SAFETY Labels](#) (Part # S-1070).

## Recordkeeping

EHS shall maintain records of all noise monitoring, including both personal noise dosimetry and area sound level surveys. Noise measurement records shall be retained for two years.

EHS shall maintain record of employee notification of results of noise monitoring.

Audiometric test records for each participant shall be maintained by EHS. Records shall be retained for the duration of the affected employee's employment.

EHS shall maintain records of the Audiometer(s) and testing booth(s) used to conduct employee testing. Documentation is to be provided by testing contractor.

EHS shall also maintain records of hearing conservation training for affected employees.

### **Recording Hearing Loss on the OSHA 300 Log:**

A Standard Threshold Shift (STS) must be entered on the OSHA 300 Form within 7 days unless a retest is performed and does not confirm the original STS.

**Table 1: Permissible Noise Exposures**

Time to reach 100% noise dose	Exposure level per NIOSH REL	Exposure level per OSHA PEL
8 hours	85 dBA	90 dBA
4 hours	88 dBA	95 dBA
2 hours	91 dBA	100 dBA
1 hour	94 dBA	105 dBA
30 minutes	97 dBA	110 dBA
15 minutes	100 dBA	115 dBA

## Guidance and Regulations

### [OSHA – Occupational noise exposure 1910.95](#)

OSHA sets legal limits on noise exposure in the workplace. These limits are based on a worker’s time weighted average over an 8 hour day. With noise, OSHA’s permissible exposure limit (PEL) is 90 dBA for all workers for an 8 hour day.

Occupational standards specify a maximum allowable daily noise dose, expressed in percentages. For example, a person exposed to 85 dBA per NIOSH or 90 dBA per OSHA over an 8-hour work shift, will reach 100% of their daily noise dose. The noise dose is based on both the sound exposure level and how long it lasts (duration) so for each increase or 3-dB (NIOSH) or 5-dB (OSHA) in noise levels, the duration of the exposure should be cut in half (this is what’s referred to as exchange rates in standards). The following table illustrates the relationship between sound exposure levels and durations for both NIOSH and OSHA.

### [NIOSH – Criteria For a Recommended Standard: Occupational Noise Exposure](#)

NIOSH establishes Recommended Exposure Limits (REL) for noise based on the best available science and practice. The NIOSH REL for noise is 85 decibels,

using the A-weighting frequency response (often written as dBA) over an 8-hour average, usually referred to as Time-Weighted Average (TWA). Exposures at or above this level are considered hazardous.