

UCSC HEARING CONSERVATION PROGRAM  
Environment, Health & Safety (EH&S)  
August 2007

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## I. Purpose

The purpose of this program is to help protect UCSC employees from hearing loss due to occupational noise exposure. Although UCSC attempts to control noise exposures on campus, certain operations and workstations may expose faculty, staff, or students to significant noise levels. All personnel who are regularly exposed to occupational noise levels at or exceeding an 8-hour time-weighted average of 85 dBA are included in the Hearing Conservation Program (HCP). This applies only to employees who incur exposure as part of their regularly assigned job duties.

## II. Applicable Regulations and Standards

### State regulations:

- Title 8, California Code of Regulations, Article 105, Sections 5096-5100: "[Control of Noise Exposure](#)"

### Federal regulations:

- 29 CFR 1910.95: "[Occupational Noise Exposure](#)"

### American National Standards Institute (ANSI):

- S1.11-1971: "Specification for Octave, Half-Octave, and Third-Octave Band Filter Sets"
- S1.25-1978: "Specification for Personal Noise Dosimeters"
- S1.4-1971: "Specification for Sound Level Meters"
- S3.6-1969: "Specifications for Audiometers"

## III. Responsibilities

### Department Heads, Managers, Supervisors, and Principal Investigators:

- Provide work environments that minimize noise to the greatest extent reasonable
- Provide hearing protective devices for employees where needed
- Request that EH&S evaluate noisy operations
- Ensure that employees exposed to noise over the action level are given training and provided with audiometric exams and hearing protective devices
- Provide easy access to hearing protective devices and ensure that employees use such devices where appropriate
- Post areas known to present noise hazards with signs requiring the use of hearing protectors

### Faculty, Staff, Students, Visitors, and Guests:

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

**Environment, Health & Safety (EH&S):**

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

**Audiometric Testing Contractor/Consultant:**

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

**IV. Definitions****Action level**

The level of noise exposure at which:

- An employee must be enrolled in the Hearing Conservation Program and provided audiometric testing
- Representative noise exposure monitoring is required by EH&S
- Hearing protectors and training on noise hazards must be provided to the employee

\*Cal/OSHA has set the current action level at 85 A-weighted decibels, or dBA, over an eight-hour period.

**Audiometric testing**

Exams that measure the sensitivity of a person's hearing threshold in decibels. The testing also establishes a baseline hearing threshold that is compared to later exams to determine if hearing loss has occurred.

**Decibel (dB)**

The standard unit used to measure sound level. The A-weighted decibel scale, abbreviated as dBA, is commonly used to measure sounds heard by the human ear. The decibel scale is logarithmic, and every three dBA is a doubling of the sound level.

**Hertz (Hz)**

The unit of measure for noise frequency in cycles per second. (1 cycle/ second = 1Hz)

**Permissible exposure limit (PEL)**

The maximum legal noise exposure, established by Cal/OSHA. The current PEL is 90 dBA over an eight-hour period.

**Noise reduction rating (NRR)**

A measure of the noise reduction that a given hearing protective device provides.

**Standard threshold shift (STS)**

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

## V. Program Overview

### Who should be included in the program?

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

### What departments or occupations are at risk for elevated noise levels?

- Physical Plant Building and Utilities Services
- Groundskeeping
- Machine Shop
- Carpentry Shop
- Housing and Dining Services

### Major elements of the program

- [Noise exposure assessments](#)
- [Audiometric testing](#)
- [Hearing protective equipment](#)
- [Employee awareness training](#)
- [Recordkeeping](#)

### Noise exposure assessments

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

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

#### *Exposure Monitoring*

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

Table 1: Permissible Noise Exposure

<b>Cal/OSHA Permissible Exposure Limits for Occupational Noise</b>	
<b>Sound Pressure Level (dB(A))</b>	<b>Duration Time (hours)</b>
80	32
81	27.9
82	24.3
83	21.1
84	18.4
85	16.0
86	13.9
87	12.1
88	10.6
89	9.2
90	8.0
91	7.0
92	6.2
93	5.3
94	4.3
95	4.0
96	3.5
97	3.0
98	2.6
99	2.3
100	2.0
101	1.7
102	1.5
103	1.4
104	1.3
105	1.0
106	0.87
107	0.76
108	0.66

109	0.57
110	0.5
111	0.44
112	0.38
113	0.33
114	0.29
115	0.25
116	0.22
117	0.19
118	0.16
119	0.14
120	0.125
121	0.11
122	0.095
123	0.082
124	0.072
125	0.063
126	0.054
127	0.047
128	0.041
129	0.036
130	0.031

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

These individuals will be offered audiometric testing, will have hearing protectors made available to them, and will be provided training on the fitting, use, and care of these devices. Persons whose eight-hour time-weighted average noise exposure is less than 85 dBA may be enrolled in the campus Hearing Conservation Program at the departmental manager's discretion, and generally do not require audiometric testing, training, or the use of hearing protectors. Additional monitoring of their personal noise exposures should not be required unless a significant change is perceived in the workplace noise level.

#### *Preliminary Noise Survey*

A preliminary noise survey consists of a "walk-through" of all facility areas with a sound-level meter to identify operations or areas where employees may be exposed to hazardous noise levels. A facility layout or grid of plant areas may be useful for recording noise levels and identifying areas that require further study.

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

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

#### *Detailed Noise Survey*

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

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

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

#### *Controls*

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

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

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

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

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

### **Audiometric Testing**

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

Audiometric tests can be scheduled by calling the testing contractor/consultant chosen by the responsible departmental manager. A list of available, reputable testing contractors can be requested from EH&S.

It is the responsibility of the supervisor of the identified department to schedule audiometric exams. The cost of the test is covered by the employee's department and is free to the employee.

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

#### *Baseline Audiograms*

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

#### *Annual Audiogram*

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

#### *Post-Employment Audiogram*

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

#### *Evaluation of the Audiogram*



An audiologist will evaluate audiometric test results and schedule any necessary follow-up evaluations. When medical personnel identify an employee with a significant threshold shift or a baseline audiogram showing early indications of hearing loss (i.e., an existing hearing level of 25 dB or greater between 500 and 4000 Hz, according to ANSI s3.6-1969), this information will be provided to EH&S so the appropriate hearing conservation and training activities can be initiated to reduce the potential for further hearing loss. The employee will be notified of these results in writing within 30 days. He or she will be retrained on the hazards and precautions of working in noisy environments and will be issued hearing protective devices if they are determined appropriate by EH&S and the medical provider. Other modifications to the workplace may also be needed to reduce noise exposures to prevent additional hearing loss.

### **Hearing protective equipment**

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

At UCSC, the use of hearing protectors is required:

- For all personnel exposed above the 85 dBA action level
- In all areas posted or otherwise designated as requiring hearing protection

A variety of suitable hearing protectors can be purchased, and employees can be given the opportunity to select their choice of hearing protection. Employees should be informed of the locations where the use of hearing protective equipment is required. Appropriate warning signs should be posted.

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

### *Types of Hearing Protectors*

- Aural (inserts): Plug-type protectors fit directly into the ear canal.
  1. Pre-molded (sized or universal)
  2. Moldable
  3. Custom molded
- Circumaural (muffs): Plastic domes that cover the ears and are connected with a spring band that fits on top of the head
- Superaural (canal caps): Caps that achieve sound attenuation by sealing the external opening to the ear canal.

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

### **Employee Awareness Training**

All employees should receive information regarding the Hearing Conservation Program through employee orientation, job training and instruction, specific training programs, and periodic safety committee meetings. The employee's department shall maintain training records.

Training topics include:

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

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

### **Recordkeeping**

Noise exposure measurement records are maintained by the Industrial Hygiene division of EH&S. Area noise exposure data are retained for a minimum of two years, and personal exposure data are retained indefinitely.

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

Employees have the right to review records of their noise exposure data and audiometric tests. It is a common procedure that these records are made available to employees.