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*University of Maine*

Hearing Conservation Program

**The University of Maine  
Orono, Maine 04469**

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## **1.0 BACKGROUND**

A hearing conservation program is to be implemented for employees subject to noise at or above an eight hour time weighted average of 85 dBA, or equivalent, as required by the Federal Government (OSHA) and adopted by Maine Department of Labor.

University of Maine supervisors and employees should consult with the Department of Safety and Environmental Management (SEM), in order to locate employees exposed to excess noise levels due to work practices or environments. \*Note - duties may only occur once per year. However, noisy processes which occur once per year may cause employees to loose their hearing, thus such exposures need to be assessed. Personal noise monitoring needs to occur for job classifications where employees may be overexposed to noise levels.

## **2.0 EXPOSURE LIMITS**

The following information details the exposure limits enforced by OSHA. By each noise level is an explanation of the basic compliance requirements. \*Note – the first two limits are eight hour averages and the third limit is a ceiling limit. Eight hour averages may be exceeded if employees are exposed to higher noise levels for a shorter amount of time.

- 85 dBA, or 50% Dose – Noise Monitoring Results, Included Hearing Conservation Program, Annual Training & Audiogram, & Hearing Protection Offered.
- 90 dBA, or 100% Dose – Noise Monitoring Results, Included Hearing Conservation Program, Annual Training & Audiogram, & Hearing Protection Required.
- 115 dBA produced at any time during an employees work shift. – Monitoring Results and Hearing Protection, which should be worn for the period of time when the 115 dBA sound level is produced.

## **3.0 SCOPE OF HEARING CONSERVATION PROGRAM**

This program applies to all employees exposed at or above an eight hour average of 85 dBA, or equivalent. This program also applies to employees subject to noise levels in excess of 115 dBA at any time during their work shift.

If you need to have noise exposures assessed in your work area please call SEM at 581-4055.

#### **4.0 PROGRAM ADMINISTRATION AND RESPONSIBILITIES**

Responsibility for implementing this program rests on the following departments and individuals:

##### **4.1 Safety and Environmental Management (SEM) shall act as program administrator and shall be responsible for the following:**

- Development, maintenance, and periodic review of the Hearing Conservation Program;
- Perform personal noise dosimetry, and otherwise assessing noise exposures;
- Provide a copy of monitoring results, to those employees monitored;
- Providing guidance for departmental compliance with this document;
- Maintain noise monitoring equipment;
- Provide guidance for selection of engineering, administrative, and other noise controls, including hearing protectors; and
- Assist supervisors in the development and implementation of a training program which meets the requirements of OSHA standard 1910.95.

##### **4.2 Human Resources shall:**

- Assist supervisors in the coordination and administration of audiograms for personnel covered by this program;
- Analyze job descriptions relevant to potential noise exposure;
- Maintain audiogram records; and
- Share audiogram test results with SEM upon request.
- Notify SEM, the supervisor and employee of any standard threshold shift.

##### **4.3 Purchasing Department shall:**

- Establish and maintain purchasing policy to support the University of Maine's commitment to Safety and the Environment. This policy shall include selection of equipment or machinery to be targeted for noise reduction through new purchases. This can be done by requesting noise level data from manufacturers, and specifying to the manufacturer what noise production is acceptable for such purchases.

##### **4.4 The "Individual Departments" shall:**

- Familiarize department employees with the HCP;

- Assist SEM in the identification of work practices generating noise levels at or above the PEL or employees suspected of being exposed to noise levels above the PEL;
- Consult SEM to determine feasibility of appropriate engineering and administrative controls;
- Participate in the University's "Buy Quiet" policy;
- Provide affected personnel with appropriate hearing protective equipment as determined by SEM;
- Provide personnel the opportunity to complete audiometric evaluations during normal working hours; and
- Require employees to wear hearing protective equipment in all situations identified by the HCP and prior to completion of audiometric examinations.

#### **4.5 The "Affected Personnel" shall:**

- Comply with the requirements of the HCP;
- Comply with requirements for annual audiometric examinations;
- Follow guidelines for completion of audiometric testing;
- Properly wear the hearing protection equipment provided, and as required by the HCP; and
- Maintain hearing protection provided.

## **5.0 EFFECTS**

Chronic noise induced hearing loss is a permanent sensorineural condition that cannot be treated medically. It is initially characterized by a declining sensitivity to high-frequency sounds, usually at frequencies above 2,000 Hertz (Hz) (Normal human speech ranges in pitch from 300 to 4000 Hz). Exposure of a person with normal hearing to workplace noise at levels equal to or in excess of the PEL may cause a shift in the worker's hearing threshold. Such a shift is called a standard threshold shift and is defined by a change in hearing thresholds of an average 10 dBA or more at 2,000, 3,000 and 4,000 Hz in either ear.

In addition to effects on hearing, noise may also:

- Interfere with speech and communications;
- Cause a stress reaction;
- Interfere with sleep;
- Lower employee morale;
- Reduce employee efficiency;
- Cause annoyance;
- Interfere with concentration; and
- Cause fatigue.

OSHA's Occupational Noise Exposure standard (29 CFR 1910.95) and subsequent amendments require that an employer must administer a continuing and effective hearing conservation program for all employees whose noise exposures equal or exceed an eight-hour time weighted average (TWA) of 85 dBA or, equivalently, a noise dose that is equal to 50 percent of the PEL. The standard also requires that all continuous, intermittent and impulsive sound levels from 80 dBA to 130 dBA be included in the measurement dose. For noise measurement purposes this essentially means a threshold for measurement of 80 dBA.

## **6.0 NOISE EXPOSURE ASSESSMENT**

In order to effectively manage a HCP, the necessary noise data must be collected. The OSHA's Occupational Noise Exposure standard (29 CFR 1910.95) and subsequent amendments require that an employer must administer a continuing and effective hearing conservation program for all employees whose noise exposures equal or exceed an eight-hour time weighted average (TWA) of 85 dBA or, equivalently, a noise dose that is equal to 50 percent of the PEL.

To verify noise exposures to employees, it is the intent of the university to conduct noise level measurements as well as analyze job descriptions. Information gathered through this process will be used to evaluate the use of and recommend engineering and administrative controls and to provide appropriate hearing protection devices. To determine occupational noise exposures, the university will employ the use of both a sound level meter (SLM) and a personal noise dosimeter. Regardless of the type of monitor used, it will be configured to have a five-dBA exchange rate (in accordance with 29 CFR 1910.95); a criteria level of 90 dBA, be set at slow response and use an 80 dBA threshold. Noise exposures will be measured for all tasks without regard for the use of hearing protectors.

Initial monitoring shall be conducted for noisy work sites or tasks to determine the noise exposure levels representative of all workers whose eight-hour TWA noise exposures may equal or exceed 85 dBA. For individuals remaining in essentially stationary, continuous noise levels, either a sound level meter or a dosimeter may be used. For individuals who move around frequently or who perform different tasks with intermittent or varying noise exposure levels, a task-based monitoring strategy may be employed.

Re-evaluations of areas observed to be in excess of 85 dBA should be conducted periodically. Monitoring shall be repeated sooner if a change in production, process, equipment or personnel might affect exposure levels. Re-evaluation may also be considered if individuals are developing significant threshold shifts.

### **6.1 Sound Level Meter**

A Sound Level Meter (SLM) shall be used in the following circumstances:



- To determine the areas approaching or exceeding the 85 dBA level;
- To determine if hazards to hearing exist;
- To evaluate specific noise sources for noise control purposes; and
- To determine whether noise presents a safety hazard by interfering with speech communication or the recognition of audible warning signals.

Noise level measurements using a SLM will be conducted in areas identified as high noise areas or locations where potential hazards exist. Measurements will occur whenever there is a change in identified process, equipment or controls, which may affect employee exposure.

## **6.2 Personal Dosimeter Monitoring**

A Personal Dosimeter Monitor (dosimeter) will be used to determine an individual's noise level exposure. The use of the dosimeter will be based upon the results of a previous noise level survey or other data indicating that employees are exposed to noise levels greater than 85 dBA at some point during their prescribed work shift. In areas where multiple employees are performing similar tasks, several employees will be chosen at random as test subjects. Resultant data will be considered representative of the exposure of all individuals performing the same task unless there is reason to believe otherwise. Monitoring will occur during periods of work considered to be typical of daily exposure. For those times that do not represent typical exposure (special process or production time), dosimetry will be performed to determine noise levels associated with those exposures.

## **6.3 Noise Analysis and Recommendations**

Area SLM and dosimeter measurements will be evaluated by SEM to identify individuals for inclusion into the University's HCP. The findings shall be reported to and used by all responsible departments to address feasibility of engineering and administrative controls to reduce noise exposures. In addition the findings shall be used to select and train individuals in the need for and the use of appropriate hearing protection devices when engineering controls cannot be used to control noise levels.

## **6.4 Employee Notification**

Sound level monitoring results will be distributed to the appropriate departments by SEM. This information shall be posted or otherwise made available to all department employees. Individual dosimeter readings shall be made available, by the appropriate department, to each individual monitored.

## **6.5 Posting**

SEM recommends to each department that has a location which has been identified of having high-risk noise levels to post a notification sign on each entrance to the location. Each sign shall state "Warning, Hearing Protection is Required in this Area".

## **7.0 ENGINEERING AND ADMINISTRATIVE CONTROLS**

To the extent feasible engineering and administrative controls shall be used to reduce noise level exposures.

### **7.1 Engineering Controls**

Engineering controls should be the first order of protection from excessive noise exposure. When the noise can be eliminated or reduced through engineering controls, the danger to hearing is reduced or eliminated as well. Any reduction in noise level helps to make the noise hazard more manageable and reduces the risk of hearing loss. In addition, if noise can be reduced to acceptable levels through implementation of engineering controls, the mandates of the HCP can be eliminated.

Engineering controls shall be used when they are deemed to be technologically and economically feasible and practical for noise reduction. Priority for implementation of engineering controls should be given to noise sources that affect the largest number of individuals. Engineering controls may be implemented to address the following:

- Reducing noise at the source (e.g. installation of a muffler);
- Interrupting the noise path (e.g. construction of an acoustic enclosure or barrier);
- Reducing reverberation (e.g. covering walls with sound absorbing materials); and
- Reducing structure-borne vibration (installation of vibration mounts).

Engineering controls for noise reduction should be considered when planning new construction or renovating existing facilities. These controls can be functionally and economically more effective if they are incorporated into the original design and purchase of equipment.

### **7.2 Administrative Controls**

Administrative controls shall be developed and implemented to supplement engineering controls but only after engineering controls have been implemented, determined unfeasible or are inadequate to reduce or limit noise exposures. In all cases, the use of administrative controls shall not result in exposing more individuals to noise. Administrative controls shall also be used to inform, train and instruct the individuals (and supervisors) in the proper means of hearing protection for the reduction of noise. Individuals shall be provided with a conveniently located, quiet and clean break or lunch area to give periodic relief from workplace noise.

### **7.3 “Buy-Quiet” Policy**

The University shall establish a “buy-quiet” policy for the purchase of new equipment. This policy shall include selection of products or processes to be targeted

for noise reduction through new purchases, setting criteria for new equipment noise levels, requesting noise level specifications from manufacturers and including noise level data in bid evaluations. Requests for Bids shall include the university's noise requirements.

## **8.0 MEDICAL SURVEILLANCE**

The University shall provide audiometry for all workers whose exposures equal or exceed 85 dBA for an 8-hour time weighted average or 50% equivalent dose.

### **8.1 Audiometry**

Audiometric test shall be performed by a physician, audiologist or an equivalent individual working under the supervision of an audiologist or physician. The professional administering the test shall include their professional license or certification number on each individual's audiogram.

The audiogram shall consist of air conduction, pure-tone, hearing threshold measures at no less than 500, 1000, 2000, 3000, 4000 and 6000 hertz (Hz). Right and left ears shall be individually tested. Audiometric tests shall be conducted with audiometers that meet the specifications of and are maintained and used in accordance with the American National Standards Institute Specifications for Audiometers (ANSI S3.6-1996 [ANSI 1996b]). Audiometers shall receive a daily functional check, an acoustic calibration check and an annual calibration (or more frequently as needed). The date of the last annual calibration shall be recorded on each audiogram.

Audiometric tests shall be conducted in a room where ambient noise levels conform to all requirements of the ANSI Maximum Permissible Ambient Noise Levels for Audiometric Test Rooms (ANSI S3.1-1991 [1991b]). For permanent testing facilities, ambient noise levels shall be checked at least annually. For mobile or transient testing facilities, ambient noise levels shall be tested daily or each time the facility is moved, whichever is more frequent. Ambient noise measurements should be taken under conditions representing the typical acoustical environment likely to be present when audiograms are performed. These levels shall be recorded on each audiogram.

### **8.2 Baseline Audiogram**

A baseline audiogram shall be obtained before employment or within 6 months of an employee's first exposure at or above the action level (50% Dose). Workers shall not be exposed to noise levels at or above 85 dBA for a minimum of 14 hours before receiving a baseline audiometric test. Hearing protectors shall not be used in lieu of the required quiet period.

### **8.3 Annual Audiogram and Re-testing**

Workers covered by the HCP shall have their hearing threshold levels measured annually. When possible, these tests shall be conducted during the worker's normal work shift. This audiogram shall be referred to as the "monitoring audiogram". The monitoring audiogram shall be evaluated immediately to determine if an employee has a change in hearing relative to his or her baseline audiogram.

If a change in hearing threshold level, in either ear, that equals or exceeds 10 decibels at 2000, 3000, or 4000 Hz is observed (relative to his or her baseline audiogram) an optional re-test may be conducted immediately to determine whether the shift is persistent. If a persistent threshold shift has occurred, the individual shall be informed that his/her hearing may have worsened (in comparison to previous tests) and additional hearing evaluations are necessary.

When a threshold shift has been observed, the individual shall receive a confirmation audiogram within thirty days. The confirmation test shall be conducted under the same conditions as those of the baseline audiogram. If this audiogram confirms a threshold shift, the audiogram and other pertinent records shall be reviewed by a physician or audiologist. If the review confirms the threshold shift, the shift is considered a significant threshold shift and shall be recorded in the workers medical records. The confirmation audiogram shall serve as the individual's new baseline examination and shall be used to calculate any subsequent, significant shift.

When a standard threshold shift has been confirmed, the university shall take appropriate action to protect the individual from additional hearing loss due to occupational noise exposure. If the physician or audiologist suspects the threshold shift is due to non-occupational exposures, the individual shall receive appropriate counseling and referral to their personal physician.

### **8.4 Exit Audiogram**

The university should obtain an exit audiogram from any individual enrolled in the HCP and who is leaving employment or whose job no longer involves exposure to noise hazards. The exit audiogram shall be conducted under the same conditions as the baseline audiogram.

### **8.5 Consultation**

Upon completion of the baseline and annual audiograms, the individual will be provided the opportunity to discuss the results of the audiogram with the physician or audiologist. At this time, the individual shall be informed of potential risks of exposures to noise above the 85 dBA and ways in which the individual may protect themselves from risks associated with such exposures.

## 9.0 HEARING PROTECTION EQUIPMENT

The most effective way to prevent noise induced hearing loss is to remove the hazardous noise from the workplace or to remove the worker from the hazardous noise, through the use of engineering or administrative controls. Hearing protection equipment should be used when engineering and administrative controls are not possible or feasible for reducing noise exposures to established safe levels. Hearing protectors may also be used as an interim solution to noise exposure while engineering controls are established.

A hearing protector is any device designed to reduce the level of sound reaching the eardrum. Earmuffs and earplugs are the main types of hearing protectors available for use at the university. Items not specifically designed for hearing protection (e.g., cotton, cloth and cigarette filters) shall not be used for hearing protection. In addition, swimmer's earmolds, hearing aids and personal stereo headphones shall not be used as hearing protection.

Each hearing protector is assigned a Noise Reduction Rating (NRR) by the manufacturer. The NRR is a number of decibels of the noise hazard that an employee will be exposed to will be reduced if the employee wears that specific type of hearing protector. This rating is determined in the laboratory and represent measurements under optimal conditions. Factors such as ear canal shape and size, type of activity and installation all have an effect on the actual NRR. To determine the actual NRR of a particular hearing protector the following conversion must be made:

$$\text{Actual NRR} = (\text{Manufacture NRR} - 7) \times 50 \%$$

The actual NRR is then subtracted from the measured sound levels. The resulting difference is the noise level the wearer is exposed to. It is important to recognize that improper fitting or incorrect wearing will significantly reduce the actual NRR. When two separate hearing protectors are used (i.e.; earplugs and ear muffs) together to provide additional attenuation it is important to note that the total affect is not additive. To determine the total NRR while using two hearing protectors add five to the great of the two actual NRR's. The resulting total shall be considered the NRR for the use of both devices concurrently.

Selection of appropriate hearing protectors should be based upon the measured noise levels an individual is exposed to, the duration of exposure, the individual wearing them, the need for compatible safety equipment and workplace conditions such as temperature, humidity and atmospheric pressure. A variety of appropriate hearing protectors will be made available to individuals required to wear them so that they can make a selection based upon comfort, ease of use and impact on communication.

## 10.0 TRAINING REQUIREMENTS

The university shall provide annual HCP training for all employees who are exposed to noise at or above an eight hour TWA of 85 dBA. Individual participation in this training shall be mandatory. Information provided during these training sessions shall be routinely updated to reflect changes in work environment, work processes and available protective equipment. The following elements shall be included in training program:

- The effects of noise on hearing;
- The purpose of hearing protectors;
- The advantages, disadvantages and attenuation of various types of hearing protectors;
- Instruction on selection, fitting, use and care of hearing protective devices; and
- The purpose of audiometric testing and an explanation of the test procedures.

The training shall also include the review of 29 CFR 1910.95. In addition, each trainee will be provided a copy of the standard.

The responsible department shall certify that the training required in this section was completed. Certification of training shall include each employee's name, the signature or initials of the trainer(s) and the dates of the training. This information shall be available for review by the employees or their authorized representatives.

## **11.0 RECORDKEEPING**

The university shall maintain records of employee dosimetry and sound level measurements. Copies of noise monitoring records will be distributed to the affected department, and be kept by the Department of Safety and Environmental Management. These records shall be maintained on file and in the Industrial Hygiene Database for a minimum of ten years. Training records shall be maintained by the originating department for a minimum of five years.

Audiometric testing records shall be maintained by Human Resources for all individuals completing these evaluations. The records shall include:

- The name and classification of the employee;
- Date of the audiogram;
- The examiner's name;
- Date of the last acoustic or exhaustive calibration of the audiometer; and
- The employee's most recent noise exposure assessment.

Accurate records of the measurements of background sound pressure levels in the audiometric testing rooms shall also be maintained. Audiometric records shall be maintained by the university for at least the duration of the affected individual's employment.

All records discussed in this section shall be provided, or made available for review, upon request to the affected individual, former employees, representatives designated by the individual employee and the Maine Department of Labor (DOL).

## **12.0 PROGRAM REVIEW/EVALUATION**

The University's HCP shall be reviewed and amended as necessary on a periodic basis. The review shall consist of amending the program to comply with current regulatory requirements and evaluation of the past years. The program shall be revised accordingly to address any problems or issues that have been observed.

*APPENDIX A - DEFINITIONS*

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

**Attenuation:** Reduction in intensity or amount.

**Audiogram:** A chart, graph or table resulting from an audiometric test showing an individuals 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 the state board of examiners.

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

**Conductive Hearing Loss:** A type of hearing loss not caused by noise exposure, but by any disorder in the middle or external ear that prevents sound from reaching the inner ear.

**Continuous Noise:** Broadband noise of approximately constant level and spectrum to which an employee is exposed for a period eight-hours per day, 40 hours per week.

**Criterion Sound Level:** The continuous equivalent A-weighted sound level that constitutes 100 percent of an allowable noise exposure. In other words, the criterion level is the permissible exposure limit (PEL). The OSHA criterion level is 90 dBA averaged over an eight-hour period on the A scale of a standard sound level meter set on slow response.

**Decibel:** Unit of measurement of sound.

**Dose:** The ratio of the amount of time that an employee was exposed to a noise at a specific level and the amount of time the employee can be exposed to that level, expressed as a percentage.

**Frequency:** The number of complete cycles per second of a vibration (or other periodic movement) usually stated in cycles per second or Hertz.

**Hearing Conservation:** The prevention or minimization of noise induced hearing loss through the control of noise through engineering controls and the use of hearing protection devices.

**Hearing Loss:** An increase in the threshold of audibility, at specific frequencies, as the result of normal aging, disease or injury to the hearing organs.



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

**Impact Noise:** A sharp burst of noise, generally less than one-half second in duration and not repeated more often than once per second.

**Intensity:** The rate of sound energy transmitted in a specific direction through a unit area.

**Intermittent Noise:** Exposure to a given broadband sound pressure levels several times during a normal working day.

**Noise:** Any unwanted sound.

**Noise-induced Hearing Loss:** Slowly progressive inner-ear hearing loss resulting from exposure to continuous noise over a long period of time, as contrasted to acoustic trauma or physical injury to the ear.

**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:** The arithmetic average of the sound absorption made by the use of hearing protection devices.

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

**Presbycusis:** Hearing loss caused by age.

**Representative Exposure:** Measurements of an employee's noise dose, or eight-hour time weighted average sound level that the employers deem to be representative of the exposures of other employees in the work area.

**Sound Level Meter:** An instrument for the measurement of sound levels.

**Threshold:** The sound level at which a personal noise dosimeter begins to integrate noise into a measured exposure.

**Threshold of Pain:** A sound pressure level sufficiently high enough to produce the sensation of pain in the human ear (usually above 120 dBA).

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

**Work Area:** A room or defined space in a work place where materials are produced or used and where employees are present.

**APPENDIX B –  
 University of Maine Job Classifications Included in the Hearing Conservation Program**

<b>Department</b>	<b>Location</b>	<b>Job Title</b>
1. Advanced Engineering Wood Composite	1. AEWB Building	1. Student Employees
2. Biological Sciences	2. Fay Hyland Arboretum	2. Director of Fay Hyland Arboretum
3. Cooperative Extension	3. Rogers Farm	3. Water Quality & Soil Specialist
4. Cooperative Forest Research Unit	4. Nutting Hall	4. Field and Data Coordinator
5. Facilities Management	5. Grounds Shop	5. Heavy Equipment Operator
6. Facilities Management	6. Grounds Shop	6. Student Employees
7. Facilities Management	7. Steam Plant	7. Watch Engineer
8. Forest Management	8. Perkins Hall	8. Laboratory Coordinator
9. Mailing & Printing Services	9. Keyo Building	9. Press Operator
10. Mailing & Printing Services	10. Keyo Building	10. Bindery Machine Operator
11. Maine Agricultural & Forest Experiment Station	11. Rogers Farm	11. Student Employees
12. Maine Agricultural & Forest Experiment Station	12. University Forest	12. Operations Manager
13. Maine Agricultural & Forest Experiment Station	13. University Forest	13. Scientific Technician II
14. Maine Agricultural & Forest Experiment Station	14. University Forest	14. Student Employees
15. Maine Agricultural & Forest Experiment Station	15. Witter Center	15. Farm Facilities & Field Coordinator
16. Maine Agricultural & Forest Experiment Station	16. Witter Center	16. Farm Technician
17. Maine Agricultural & Forest Experiment Station	17. Witter Center	17. Witter Center Superintendent
18. Public Safety	18. Shooting Range	18. Officers
19. Public Safety	19. Public Safety Building	19. Police Lieutenant