

Hearing Conservation Program

Purpose and Scope

Exposure to excessive noise in the workplace can cause permanent hearing loss. Although The Hearing Conservation Program establishes procedures to identify potentially hazardous noise levels on campus, personnel at risk of exposure, and control measures to reduce or eliminate exposure.

The provisions of the Hearing Conservation Program shall include all employees exposed to noise levels equal to or exceeding the action level of 8-hour time-weighted average (TWA) of 85 dBA.

Responsibilities

Environmental Health and Safety

- Develop and implement a written hearing conservation program and review it on an annual basis;
- Conduct noise surveys and noise dosimetry to identify work areas and activities associated with high noise levels and personnel who are at risk of exposure.
- Assist supervisors in the selection of appropriate hearing protection and provide recommendations for appropriate engineering controls.
- Assist to provide or arrange for training on hearing conservation and audiometric testing for faculty and staff.
- Conduct or arrange for the appropriate selection and fitting of hearing protection.
- Maintain training and hearing protection records.

Departments

- Provide fiscal and administrative resources for audiometric testing and the implementation of the Hearing Conservation Program within their unit.
- Ensure that all personnel identified by EHS as having noise exposure equal to or exceeding the action level receive proper training.

Supervisors/Managers

- Contact EHS when they suspect that hearing protection may be required for a task.
- Attend training on noise and hearing conservation when employees they supervise are required to use such equipment.
- Supply the appropriate hearing protection at no cost to the employee and ensure that it is worn according to the training received.
- Assure that the requirements of this program are observed with respect to noise surveys, noise dosimetry, and audiometric testing, training, and record keeping.

Employees

- Report to the supervisor any operation or job for which they suspect that hearing protective equipment may be needed.
- Attend training on the hearing protection as required by this program.

- Use hearing protection in accordance with instruction and training received.
- Not use hearing protection with any deficiencies and report any deficiencies or malfunctions to a supervisor.
- Notify the supervisor of a noticeable change in hearing, or potential problem with the hearing protection.

Medical Provider

- Conduct or supervise qualified persons to conduct an audiometric testing per the OSHA Noise standard.
- Provide the Hearing Protection wearer and EHS with written results of the medical evaluation as it applies to the employee's ability to hear.

Procedures

Monitoring

When information indicates that an employee's exposure may equal or exceed the action level of 85 dBA for an 8-hour TWA assessment, monitoring shall be conducted by EHS. Affected employees shall be notified of the results of the monitoring where levels at or above the action level are identified. Monitoring activities may consist of:

- Sound level measurements for locations where the noise level is stationary and expected to be continuous.
- Personal noise dosimetry for work operations that are highly mobile or random in noise level.
 - A noise dosimeter is placed near the employee's ear (i.e. collar or shoulder) for the duration of a work shift or task to determine the 8-hour TWA noise exposure
 - Results are compared to established exposure limits
- Re-monitoring, if a change in equipment, process or controls increases the noise level to the extent that:
 - Additional employees may be exposed at or above the action level.
 - The attenuation provided by the hearing protectors used by the employee(s) does not reduce the noise exposure level to 90 dBA for an 8 hour TWA or 85 dBA as 8 hour TWA for employees that have experienced a standard threshold shift.
 - Follow-up monitoring if an STS has occurred.
- The opportunity for affected employees to observe the noise measurements during collection.

Audiometric Testing

All employees exposed to noise at or above the Action Level are required to participate in the program. This program consists of:

- A baseline test to be completed within 6 months of the employee's first exposure above the action level. This test must be preceded by at least 14 hours without exposure to workplace noise at or above 85 dBA or hearing protection devices must be used prior to testing.
- Annual testing thereafter provided that exposure at or above the action level is expected.
- Training of affected employees regarding the hazards of noise exposure, and where necessary the fitting of employees with appropriate hearing protection devices and training about their use, care and limitations.

- A follow-up audiogram may be provided within 30 days if a standard threshold shift has been identified. The employee shall be informed in writing within 21 days of the determination.
- Audiometric testing reviewed by an audiologist. The audiologist will determine if further evaluation or retraining is needed.
- Maintenance of audiometric testing equipment in accordance with the requirements of the OSHA Occupational Noise Standard (29 CFR 1910.95 and its appendices).

Audiometric testing services are provided by:
 West Chester University Speech and Hearing Clinic
 201 Carter Drive, Suite 400
 West Chester, PA 19383
 (610) 436-3402

Noise Control

Where noise levels for non-mobile sources are found to be in excess of 90 dBA or above the Permissible Noise Exposure as listed in Table 1 on a continuous basis and employees are required to work in such areas the following measures shall be taken:

- Engineering controls will be reviewed for feasibility in noise reduction. Until they are implemented or if adequate controls are not feasible then;
- Hearing protection devices shall be worn by employees whose exposure is at or above 90 dBA as an 8 hour TWA. Hearing protection devices will be made available to exposed employees at no cost. Hearing protection attenuation shall reduce the exposure below 90 dBA as an 8 hour TWA using the NRR of the rated device.
- For employees exposed to noise levels at or above 85 dBA, but below 90 dBA as an 8 hour TWA the use of hearing protection devices shall be strongly encouraged.

Engineering Controls

The primary means of reducing or eliminating personnel noise exposure shall be through the application of engineering controls. Engineering controls are defined as any modification or replacement of equipment, or related physical change at the noise source or along the transmission path that reduces the noise level at the employee's ear.

Administrative Controls

Administrative controls are defined as changes in the work schedule or operations that reduce personnel noise exposure. If engineering solutions cannot reduce the noise level, administrative controls such as increasing the distance between the noise source and the worker or rotation of jobs between workers in the high noise area should be implemented if possible.

Training

Employees who work in a designated noise area where exposures to noise can be at or above 85 dBA will be trained when first assigned to the work area and annually thereafter. Training will be provided by EH&S or staff members designated by EH&S, who are knowledgeable on the requirements of the UW Hearing Loss Prevention Program.

The supervisor is responsible for ensuring that the designated employees are trained and that a written record of the employee's initial and annual refresher training is maintained.

The training content will address the following:

- The purpose of a hearing loss prevention program.
- The responsibilities of managers, supervisors, and employees in preventing noise induced hearing loss.
- The effects of noise exposure, both occupational and non-occupational, on hearing
- The purpose of hearing protection, and the advantages, disadvantages, and attenuation of various types of hearing protectors.
- The selection, fit, use, and care of various types of hearing protectors.
- The purpose of audiometric testing, and an explanation of the test procedures. The findings of the noise monitoring survey.
- Employee access to exposure monitoring and audiometric test results.

Record Keeping

The audiometric testing clinic shall maintain audiometric exams for each tested employee for the duration of that employee's participation in the program. Upon leaving employment from the University or discontinuance in the Hearing Conservation program, all records will be transferred to EHS. EHS shall maintain all noise monitoring data.

Definitions

- **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, which is certified by the American Speech-Language-Hearing Association or licensed by a state board of examiners.
- **Baseline audiogram** - The audiogram against which future audiograms are compared.
- **Criterion sound level** - A sound level of 90 decibels.
- **Decibel (dB)** - Unit of measurement of sound level.
- **Hertz (Hz)** - Unit of measurement of frequency, numerically equal to cycles per second.
- **Medical pathology** - A disorder or disease. For purposes of this regulation, a condition or disease affecting the ear, which should be treated by a physician specialist.
- **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.
- **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 micro pascals.

Unit: decibels (dB). For use with this regulation, SLOW time response, in accordance with ANSI S1.4-1971 (R1976), is required.

References

- OSHA 29 CFR 1910.95, "Occupational noise exposure" and relevant appendices
- OSHA 29 CFR 1904.5, "Determination of work-relatedness".
- OSHA 29 CFR 1904.10, "Recording Criteria for Cases Involving Occupational Hearing Loss".
- ANSI S1.11-1971 "Specification for Octave, Half-Octave, and Third-Octave Band Filter Sets"
- ANSI S1.25-1978 "Specification for Personal Noise Dosimeters"
- ANSI S1.4-1971 "Specification for Sound Level Meters"
- ANSI S3.6-1969 "Specifications for Audiometers"

Reviewed: May, 2022

TABLES

TABLE 1: 8- HOUR TWA SOUND LEVELS & ALLOWABLE EXPOSURE TIMES			
Sound Level (dBA) (loudness)	Allowable Exposure Duration (Hours)	<p>For brevity, only dBA values that are multiples of 5 are shown. Shaded areas represents OSHA defined exchange rate. The complete table G-16A at 29 CFR 1910.95 App A will be used. Allowable exposure duration is time in hours at a dBA level, which constitutes an exposure equivalent in energy and sound dose to 90 dBA for 8 hours.</p> <p>Calculations/Definitions: Allowable exposure time may be calculated using the following equation for sound levels not specified in this table: $T = 8/2^{(L-90)/5}$ Where T = Allowable Exposure Duration and L = measured A-weighted sound level.</p> <p>Example: measured sound level = 75 dBA $T = 8/2^{(75-90)/5} = 64$ hours Allowable Exposure Duration</p>	
80	32		
85	16		
90	8		
95	4		
100	2		
105	1		
110	0.5		
115	0.25		
120	0.125		
125	0.063		
130	0.031		
Sound levels below 80 dBA are not included in exposure calculations. A dose of 50% or more, or an 8h-TWA of 85 dBA or higher, triggers the Action Level requirements and mandates an employee's participation in the Purdue Hearing Conservation Program.			

TABLE 2: PERCENT NOISE EXPOSURE (DOSE) AND EQUIVALENT 8-HOUR TWA		
Dose (%)	8-Hour TWA	<p>For brevity, a shorten selection of dose values are shown. The complete list is given in table A-1 of 29 CFR 1910.95, Appendix A.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>The dose may be calculated using the following formula: $Dose = 100 \times \{(C_{Level1})/(T_{Level1}) + (C_{Level2})/(T_{Level2}) + (C_{Leveln})/(T_{Leveln})\}$ Where C = time of exposure at any noise level and T = allowable exposure time, in hours given by Table 1.</p> </div> <p>Example: 100 dBA for 1 hour, 95 dBA for half hour, and 80 dBA for 4h $Dose = 100 \times \{1/2 + 0.5/4 + 4/32\} = 100 \times \{0.5 + 0.125 + 0.125\} = 75\%$</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>For a dose greater than or less than the values printed in the chart use the following equation to calculate the TWA: $8h-TWA = 16.61 \log(10) (D/100) + 90$ Where D = accumulated dose in percent exposure.</p> </div> <p>Example: Dose = 75% $8h-TWA = 16.61 \log(.75) + 90 = 16.61(-.1249) + 90 = -2.07 + 90 = 87.93$ dBA</p>
10	73.4	
20	78.4	
30	81.3	
40	83.4	
50	85.0	
60	86.3	
70	87.9	
80	88.4	
90	89.2	
100	90.0	
120	91.3	
140	92.4	
160	93.6	
180	94.2	
200	95.0	
240	96.3	
280	97.9	
300	97.9	
400	100.0	
500	101.6	

APPENDICES

Appendix A: Noise Data Collection Form

Noise Data Collection Form: Area Survey

Name: _____ Date: _____ Time: _____

Monitoring Equipment

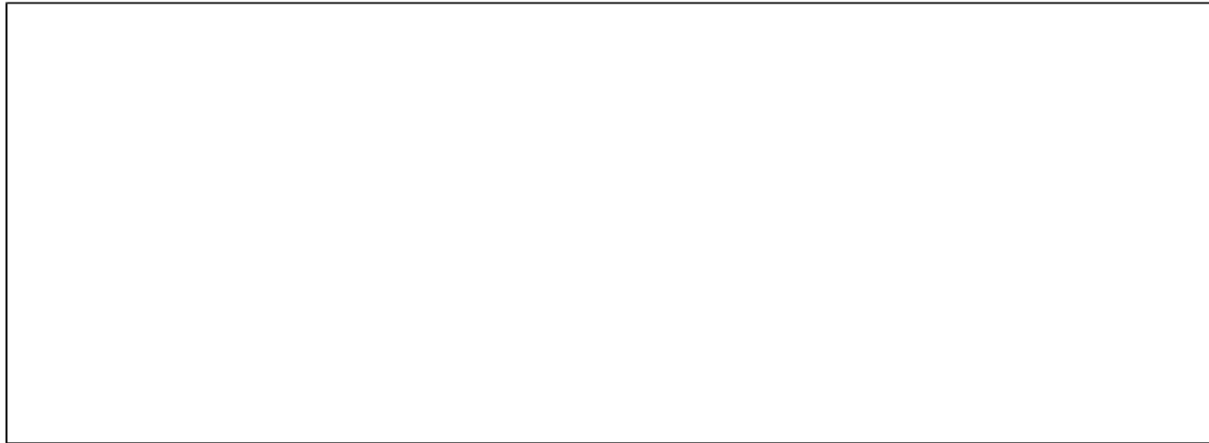
TSI/Quest Sound Examiner SE-402
Pre-Calibration Post-Calibration

Area Details

Building: _____ Location Type: _____ Room Number: _____

Description of Activity or Equipment: _____

Diagram of Sampling Locations



Results

Location	Duration (sec)	L _{AVG} (dBA)	L _{MAX} (dBA)	L _{PK} (dBA)

Comments

