



**ARIZONA STATE UNIVERSITY**  
**Department of Environmental Health & Safety**

Hearing Conservation Program  
Pursuant to 29 CFR § 1910.95

**Revision Date: Feb. 2009**

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**Hearing Conservation Program**

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**Arizona State University Environmental Health & Safety  
Hearing Conservation Program**

**Purpose**

The primary purpose of Arizona State University's Hearing Conservation Program is to protect employees from noise exposure; conserve hearing ability; and prevent occupational hearing loss. The intent of this program is educational, preventive, and to fulfill the requirements for a written control plan required by the Occupational Safety and Health Act (OSHA), Title 29 of the Code of Federal Regulations, section 1910.95. A copy of this standard is attached to the end of this document as Appendix B.

**Scope and Application**

This program shall apply to all Arizona State University (ASU) employees whose noise exposures equals or exceeds an 8-hour time weighted average (TWA) sound level of 85 decibels (dB), otherwise known as the action level, while performing their work activities. These employees must be enrolled into the hearing conservation program.

The program shall also apply to those employees who are exposed to noise in excess of the OSHA permissible exposure limits (PEL) outlined in the table below. When feasible engineering and/or administrative controls do not reduce the noise level to or below these PEL's, proper hearing protection devices must be used.

**Table 1 – Permissible Noise Exposure Limit (PEL)**

<b>Duration per day (hours)</b>	<b>Sound Level dBA slow response</b>
8	90
6	92
4	95
3	97
2	100
1 ½	102
1	105
½	110
¼ or less	115

Excessive noise exposure can cause both temporary and permanent changes in hearing sensitivity. Repeated exposures over time can result in hearing loss, physical and psychological disorders, interfere with the detection of warning sounds, disruption of job performance, and more importantly, interfere with speech and communication.

## **Responsibilities**

### University:

Arizona State University is classified as a non-manufacturing employer where a select number of employees are exposed to hazardous conditions, such as excessive noise, during the course of their employment. It is the responsibility of ASU to maintain a Hearing Conservation Program for university employees who may be exposed to excessive noise levels during the performance of their duties. In addition, the university must design the Hearing Conservation Program to achieve regulatory compliance and provide a means for employees to be better informed about and protected from excessive noise levels and hearing loss.

### Environmental Health & Safety:

The overall responsibility to develop and implement occupational health and safety programs for the university falls with the Department of Environmental Health & Safety (EH&S). Although it is the overall responsibility of EH&S to develop these programs, it is ultimately up to each department or unit supervisor to ensure that employees are provided the vital support and means to adequately carry out the provisions of each program and achieve regulatory compliance with all OSHA requirements. Responsibilities of EH&S related to the ASU Hearing Conservation program include:

- (1) Develop, implement and administer the Arizona State University Hearing Conservation Program and written plan;
- (2) Provide the technical expertise and equipment necessary to identify work areas and equipment within ASU facilities where noise levels equal or exceed 85 dBA;
- (3) Provide the technical expertise and equipment necessary to identify, through personnel monitoring, ASU employees whose noise exposure levels equal or exceed an 8-hour Time-Weighted Average (TWA) of 85 dBA;
- (4) Periodically re-monitor identified at-risk employees;
- (5) Resurvey work areas and equipment when notified that noise levels may have changed due to facility or equipment modification;
- (6) Identify potential high noise areas or equipment during routine building activities and measure sound levels to determine need for additional monitoring or protective equipment;
- (7) Recommend appropriate type(s) of hearing-protective devices necessary to protect employees' hearing;
- (8) Train employees on mandatory elements of the ASU Hearing Conservation Program;
- (9) Provide recommendations concerning noise control measures including engineering controls and administrative controls; and
- (10) Maintain records of noise measurement and employee training.

### Department/Unit Program Administrator:

The Program Administrator is responsible for administering the Hearing Conservation Program and has the authority to make decisions and implement changes, as necessary. A Program Administrator must be designated by each department or unit with employees exposed to noise hazards. Duties of the Program Administrator include:

- (1) Identify to ASU Environmental Health & Safety equipment and locations where high noise levels are suspected;
- (2) Identify to ASU Environmental Health & Safety all employees who may be exposed to excessive noise levels;
- (3) Ensure all employees with documented high noise exposures enroll in the medical surveillance program for noise;
- (4) Arrange for/or conduct training on mandatory elements of the ASU Hearing Conservation program;
- (5) Document and maintain all records pertaining to employee audiometric examinations and training;
- (6) Establish and maintain all standard operating procedures;
- (7) Determine whether administrative and/or engineering controls can be used in lieu of hearing protective equipment and implement these controls when feasible;
- (8) Contact ASU Environmental Health & Safety when new procedures are implemented or new equipment is utilized that may affect an employee's noise exposure;
- (9) Evaluate the program for effectiveness; and
- (10) Make copies of the OSHA Occupational Noise Exposure Standard, 29 CFR §1910.95, available to employees and post it in the workplace.

Department/Unit Supervisors:

Supervisors are responsible for ensuring that the Hearing Conservation Program is implemented in their particular areas. In addition to being knowledgeable about the program requirements for their own protection, supervisors must also ensure that the program is understood and followed by the employees under their charge. Supervisors will maintain surveillance of work conditions in all places where employees for whom they are directly responsible work, as well as employee exposures and stress, in order to determine if any additions to, or changes in, hearing protection use requirements are needed. The Supervisor shall promptly notify employees of changes whenever they are needed. Duties of the Supervisor include:

- (1) Ensure that employees under their supervision (including new hires) have received appropriate training and medical surveillance;
- (2) Determine appropriate type(s) of hearing-protective devices necessary to protect employees' hearing;
- (3) Ensure the availability of appropriate hearing-protective devices;
- (4) Monitor and enforce the use of hearing protective devices when required and ensure those only properly trained and medically evaluated employees use the devices;
- (5) Continually monitor work areas and operations to identify noise hazards; and
- (6) Coordinate with the Program Administrator on how to address hearing hazards or other concerns regarding the program.

Employees exposed to TWA noise exposures at or over 85 dBA:

- (1) Use safe work practices;
- (2) Wear and maintain appropriate hearing protective devices as instructed while performing job functions;
- (3) Attend annual training on noise and hearing protection;
- (4) Participate in annual audiometric testing;

- (5) Use only those brands/types of hearing protection devices which are appropriate for the noise exposure, and for which the employees have been trained and fitted;
- (6) Report to their supervisor changes in the workplace or "noisy" conditions; and
- (7) Comply with all provisions of the Hearing Conservation Program.

Employees with periodic exposure to high noise and whose TWA noise levels are below 85 dBA

- (1) Wear and maintain hearing protective devices as instructed; and
- (2) Report to their supervisor any changing conditions that may impact personal noise exposures.

**Hearing Conservation Program Elements**

Evidence is well established that worker exposure to noise of sufficient intensity and duration can result in permanent hearing damage. Noise-induced hearing loss rarely results from a single exposure; it can progress unnoticed over a period of years. Early noise-induced hearing loss occurs at the higher frequencies where the consonant portion of speech occurs, making communication difficult.

The Occupational Safety & Health Administration (OSHA) requires employers to:

- A. Monitor facilities and employees to determine noise overexposure situations,
- B. Develop and implement a written hearing conservation program that identifies the methods used to comply with regulatory requirements,
- C. Implement an audiometric testing program for employees with high noise exposures to determine if exposure impacts hearing ability,
- D. Provide appropriate hearing protection to employees with high noise exposures if other methods of noise control are not feasible or during installation of such controls,
- E. Provide annual training for employees with high noise exposures, and
- F. Maintain medical and monitoring records pertaining to the hearing conservation program.

To meet these requirements, Arizona State University has established this Hearing Conservation Program. Program elements are described below.

**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.

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 exceed prescribed levels, personal monitoring using dosimeters is then performed. Affected employees or their representatives shall be provided with an opportunity to observe any noise monitoring conducted.

**Area Measurements:**

In an area survey, measurements of noise levels are documented (see Appendix C) using a sound level meter to identify work areas where employees' exposures may be above the action

level; thus 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
- At other locations within the area where the employee might work

If noise levels are below 85 dBA in the area, no further monitoring is 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 equal or exceed a noise level of 85 dBA and the duration of exposure each day is unknown, employees who work in or near the high noise area or equipment shall have their noise exposure determined through personal monitoring using dosimeters. If the measurements equal or exceed 85 dBA, but the time of exposure is sporadic and less than the permissible exposure level, personal monitoring will not be required. Recommendations will be made to wear hearing protection while operating in that area or with that piece of equipment.

#### Personal Monitoring:

Determination of personal noise exposures will be accomplished using calibrated noise dosimeters. The dosimeter will calculate an eight-hour time-weighted average (TWA). Sound levels from 80 – 130 decibels (dBA) will be integrated into the noise measurement. Instruments used will be calibrated to ensure measurement accuracy. 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. Background information will be collected from each employee detailing job description, unusual job activities, etc., for the sample period (see Appendix D). Those employees whose noise exposures equal or exceed 85 dBA as an 8-hour TWA will be identified to supervisors for enrollment into the Hearing Conservation Medical Surveillance Program.

#### Re-monitoring of Hazardous Noise Areas:

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

#### Re-monitoring Due to Changes:

Any area with noise levels that equal 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 85 dBA due to alterations in equipment, controls or process changes shall be eliminated from the monitoring program.

Environmental Health & Safety shall provide copies of personal exposure monitoring results to the supervisors of monitored employees in areas under their control. Supervisors will notify their employees of the results.

#### Medical Surveillance/Audiometric Testing Program

Upon identification of employees whose 8-hour TWA equals or exceeds 85 dBA, the Program Administrator shall contact a Professionally Licensed Healthcare Provider (PLHCP), either a qualified physician, otolaryngologist, audiologist or certified technician, to enroll these employees in the ASU Hearing Conservation Medical Surveillance Program. Environmental Health & Safety can provide the Program Administrator with names of local PLHCP's. Information supplied to the PLHCP will include the employee's name, supervisor's name, work telephone number(s) and the noise levels recorded in the employee's work area. The Program Administrator will forward copies of dosimetry data to the PLHCP. It is the responsibility of supervisors to enroll their employees in the ASU Hearing Conservation Medical Surveillance Program.

Affected departments are responsible for costs associated with the ASU Hearing Conservation Medical Surveillance Program. A fee will be charged for audiometric testing and interpretation of the results.

In work locations where either through administrative or engineering controls, noise levels decrease such that the employees' 8-hour TWA's are below 85 dBA, the Program Administrator shall notify the PLHCP and the employees' supervisors, in writing, that the employees working in that area are no longer required to be enrolled in the ASU Hearing Conservation Program.

The supervisor is responsible for scheduling employee audiometric testing with a PLHCP. Employees with exposure to TWA noise levels of 85 dBA or greater must have baseline audiometric testing performed within 6 months of initial noise exposure. The employee should not be exposed to workplace noise for at least 14 hours prior to the baseline audiogram. Hearing protection may be worn as a substitute for this requirement. The supervisor should also notify the employee to avoid high levels of non-occupational noise during this period.

The PLHCP has the responsibility for administering the Audiometric Testing Program portion of the ASU Hearing Conservation Program. A qualified physician, otolaryngologist, audiologist or certified technician will perform the audiogram examination. The testing must conform to OSHA's requirements on audiometric testing, which are covered in Appendices C through F in the Occupational Noise Exposure Standard. The object of the audiometric testing program is to identify workers beginning to experience hearing loss to allow intervention before the hearing loss progresses. Audiometric testing will be provided to all employees with exposure to TWA noise levels of 85 dBA or greater. Annual retesting will be performed for all personnel enrolled in the ASU Hearing Conservation Medical Surveillance Program until separation from employment or upon transfer to duties with noise exposures below 85 dBA.

Audiometric testing not only monitors the sharpness or acuity of an employee's hearing over time, but also provides an opportunity for employers to educate employees about their hearing and the need to protect it. The important elements of the audiometric testing program include baseline audiograms, annual audiograms, training, and follow-up procedures. Audiometric testing must be made available at no cost to employees exposed to TWA noise levels of 85 dBA or greater. Annual audiograms must be conducted within 1 year of the baseline. Annual audiograms must be routinely compared to baseline audiograms to determine if the employee has lost hearing ability (i.e., if a standard threshold shift (STS)

has occurred). STS is defined as an average hearing loss in either ear of 10 dB or more at frequencies of 2000, 3000, and 4000 hertz.

If the annual audiogram shows that an employee has experienced a STS, the PLHCP will arrange for the employee to retest within 30 days, and the results of the retest will be used as the annual audiogram. If a STS is indicated, the employee shall be informed of this fact in writing within 21 days of the determination. If a PLHCP determines the STS may be work-related or aggravated by occupational noise exposure, the employee will be referred for a follow-up clinical audiological evaluation. The employee's supervisor will also be notified of the STS and shall ensure that the employee has appropriate hearing protection, is trained in their use and care, and required to use them. Employees already using hearing protection shall be refitted (if necessary) and retrained in the use of hearing protection and provided hearing protection offering greater attenuation if necessary.

### Hearing Protection

The primary means of reducing or eliminating personnel exposure to hazardous noise is 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. Engineering controls such as mufflers on heavy equipment exhausts or on air release valves are required where possible.

Administrative controls are defined as changes in the work schedule or operations which reduce noise exposure. If engineering solutions cannot reduce the noise, 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 used if possible.

The use of engineering and administrative controls should reduce noise exposure to the point where the hazard to hearing is eliminated or at least more manageable.

Hearing protective devices (ear plugs, muffs, etc.) shall be the permanent solution only when engineering or administrative controls are considered to be infeasible or cost prohibitive. Hearing protective devices are defined as any device that can be worn to reduce the level of sound entering the ear. Departments shall make hearing protection available at no cost to their employees who are exposed to TWA noise levels of 85 dBA or greater. Hearing protection will also be provided to employees with routine periodic noise exposures over 85 dBA.

Types of Hearing Protective Devices:

#### Insert Type Earplugs

A device designed to provide an air-tight seal with the ear canal. There are three types of insert earplugs - premolded, formable, and custom earplugs.

#### Premolded Earplugs

Premolded earplugs are pliable devices of fixed proportions. Two standard styles, single flange and triple flange, come in various sizes, and will fit most people. Personnel responsible for fitting and dispensing earplugs will train users on proper insertion, wear, and care. While premolded earplugs are reusable, they may deteriorate and should be replaced periodically.

### Formable

Formable earplugs come in just one size. Some are made of material which, after being compressed and inserted, expands to form a seal in the ear canal. When properly inserted, they provide noise attenuation values that are similar to those from correctly fitted premolded earplugs. Each earplug must be held in place while it expands enough to remain firmly seated. A set of earplugs with a cord attached is available. These earplugs may be washed and therefore are reusable, but will have to be replaced after two or three weeks or when they no longer form an airtight seal when properly inserted.

### Custom Molded Earplugs

A small percentage of the population cannot be fitted with standard premolded or formable earplugs. Custom earplugs can be made to fit the exact size and shape of the individual's ear canal. Individuals needing custom earplugs will be referred to an audiologist.

### Earmuffs

Earmuffs are devices worn around the ear to reduce the level of noise that reaches the ear. Their effectiveness depends on an air tight seal between the cushion and the head. Hearing protection shall be replaced as necessary.

Employees shall be given an opportunity to select their hearing protection from a variety of suitable devices. The Program Administrator shall provide training in the use and care of all hearing protection devices provided to employees. The supervisor shall monitor the correct use of all hearing protection. Environmental Health & Safety shall determine hearing protection attenuation necessary for the specific noise environments in which the hearing protection will be used. Only hearing protection with a suitable noise reduction ratio (NRR) will be used. The NRR used for calculating attenuated noise exposure levels will be calculated in the following manner, using a safety factor of 50%:

$$\text{Reduction (dB)} = (\text{NRR} - 7) \div 2$$

For example: If the NRR on a pair of earplugs is 21, subtract 7 from that number and divide that by 2,  $(21 - 7) \div 2 = 14 \div 2 = 7$ . Therefore, this pair of earplugs will reduce the TWA 7 decibels and the supervisor must determine if this will be enough protection for the employee.

Hearing protection must attenuate (lower) employee exposure at the ear to no more than a TWA noise level of 85 dBA. The adequacy of hearing protection shall be reevaluated whenever employee noise exposures increase to the extent that the hearing protection may no longer provide adequate attenuation.

Employees whose 8-hour TWA noise exposures do not meet or exceed 85 dBA will be provided hearing protection if their duties require entry into noise hazard areas or use of loud equipment where sound levels measure over 85 dBA. These areas or pieces of equipment should be placarded with signs advising employees that hearing protection should be worn.

Any personnel experiencing difficulty in wearing assigned hearing protection (i.e., irritation of the canals, pain) will be advised during training to immediately report this to their supervisor to schedule an appointment with the PLHCP for evaluation as soon as possible.

## Training

Before using earplugs/and or earmuffs, each employee who is exposed to noise levels at or above an eight-hour TWA of 85 dBA must receive training. This will be provided to employees upon initial work assignment to areas that are identified as excessively noisy, and annually thereafter or upon request.

When workers understand the reasons for the ASU Hearing Conservation Program requirements and the need to protect their hearing, they will be better motivated to participate actively in the program and to cooperate by wearing their hearing protection and taking audiometric tests. Environmental Health & Safety or supervisory personnel knowledgeable of the requirements of the ASU Hearing Conservation Program may provide this training annually to employees exposed to 8-hour TWA noise exposures of 85 dB and above concerning:

1. The ASU Hearing Conservation Program,
2. The effects of noise on hearing,
3. The purpose, advantages, and disadvantages and attenuation of various types of hearing protection,
4. The selection, fit, use and care of hearing protection,
5. The purpose of audiometric testing and an explanation of the test process, and
6. Noise hazard areas.

A copy of the Occupational Noise Exposure Standard will be made available to employees and posted in the workplace (a copy can be found in Appendix B).

Training will be documented on forms provided by Environmental Health & Safety at the time of training. Information in the annual training program will be updated to be consistent with any changes in protective devices and work processes.

## **Program Evaluation**

The Program Administrator will conduct periodic program evaluations to assess compliance with federal and state regulations and ASU Hearing Conservation Program requirements. Both the monitoring and audiometric testing portions of the ASU Hearing Conservation Program will be reviewed annually to assure its quality and effectiveness. An evaluation of the program, including training records and course content, maintenance of hearing protection devices and field audits of hearing protection use and record keeping will be conducted at least annually.

Problems identified will be noted in an inspection log and addressed by the Program Administrator. These findings will be reported to ASU Environmental Health & Safety, and the report will list plans to correct deficiencies in the program and target dates for the implementation of those corrections.

## **Record Keeping**

Audiometric test records must include the name and job classification of the employee, the date, the examiner's name, the date of the last acoustic or exhaustive calibration, measurements of the

background sound pressure levels in audiometric test rooms, and the employee's most recent noise exposure measurement.

The Program Administrator shall maintain an accurate record of all employee exposure measurements. Noise exposure measurement records must be kept for 2 years and all employee audiometric testing records for the duration of employment. Employee records shall be provided upon request by the employee, former employee or designated representative.

# Appendix A

## 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.

**Attenuation** – Sound reduction.

**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.

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

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

**Decibel A-weighted (dBA)** - A unit used to express sound power at frequencies though to provide a rating that indicates the injurious effects on the human ear. This is the preferred unit of measure by OSHA.

**Hearing Protective Device** - Any device that can be worn to reduce the level of sound entering the ear

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

**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.

**OSHA** - Occupational Safety and Health Administration is responsible for the promulgation, modification, and enforcement of occupational safety and health standards.

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

**Noise Reduction Rating (NRR)** – Developed by the U.S. Environmental Protection Agency to aid in determining the adequacy of hearing protection devices in a given environment.

**Permissible Exposure Limit (PEL)** - Exposure limit published and enforced by OSHA as a legal standard.

**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 (STS)** – An average hearing loss in either ear of 10 dB or more at frequencies of 2000, 3000, and 4000 hertz.

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

**Appendix B**  
OSHA Standard on Occupational  
Noise Exposure  
**29 CFR § 1910.95**  
**Regulations (Standards - 29 CFR)**

**Occupational noise exposure. - 1910.95**

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[◀ OSHA Regulations \(Standards - 29 CFR\) - Table of Contents](#)

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- **Standard Number:** 1910.95
- **Standard Title:** Occupational noise exposure.
  - **SubPart Number:** G
- **SubPart Title:** Occupational Health and Environmental Control

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**(a)**

Protection against the effects of noise exposure shall be provided when the sound levels exceed those shown in Table G-16 when measured on the A scale of a standard sound level meter at slow response. When noise levels are determined by octave band analysis, the equivalent A-weighted sound level may be determined as follows:

FIGURE G-9 - Equivalent A-Weighted Sound Level  
(For Figure G-9, [Click Here](#))

Equivalent sound level contours. Octave band sound pressure levels may be converted to the equivalent A-weighted sound level by plotting them on this graph and noting the A-weighted sound level corresponding to the point of highest penetration into the sound level contours. This equivalent A-weighted sound level, which may differ from the actual A-weighted sound level of the noise, is used to determine exposure limits from Table 1.G-16.

**(b)**

**(b)(1)**

When employees are subjected to sound exceeding those listed in Table G-16, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce

sound levels within the levels of Table G-16, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table.

**(b)(2)**

If the variations in noise level involve maxima at intervals of 1 second or less, it is to be considered continuous.

TABLE G-16 - PERMISSIBLE NOISE EXPOSURES (1)

Duration per day, hours	Sound level dBA slow response
8.....	90
6.....	92
4.....	95
3.....	97
2.....	100
1 1/2 .....	102
1.....	105
1/2 .....	110
1/4 or less.....	115

Footnote(1) When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions:  $C(1)/T(1) + C(2)/T(2) + \dots + C(n)/T(n)$  exceeds unity, then, the mixed exposure should be considered to exceed the limit value. Cn indicates the total time of exposure at a specified noise level, and Tn indicates the total time of exposure permitted at that level. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

**..1910.95(c)**

**(c)**

"Hearing conservation program."

**(c)(1)**

The employer shall administer a continuing, effective hearing conservation program, as described in paragraphs (c) through (o) of this section, whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level (TWA) of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of fifty percent. For purposes of the hearing conservation program, employee noise exposures shall be computed in accordance with appendix A and Table G-16a, and without regard to any attenuation provided by the use of personal protective equipment.

**(c)(2)**

For purposes of paragraphs (c) through (n) of this section, an 8-hour time-weighted average of 85 decibels or a dose of fifty percent shall also be referred to as the action level.

**(d)**

"Monitoring."

**(d)(1)**

When information indicates that any employee's exposure may equal or exceed an 8-hour time-weighted average of 85 decibels, the employer shall develop and implement a monitoring program.

**(d)(1)(i)**

The sampling strategy shall be designed to identify employees for inclusion in the hearing conservation program and to enable the proper selection of hearing protectors.

**(d)(1)(ii)**

Where circumstances such as high worker mobility, significant variations in sound level, or a significant component of impulse noise make area monitoring generally inappropriate, the employer shall use representative personal sampling to comply with the monitoring requirements of this paragraph unless the employer can show that area sampling produces equivalent results.

**..1910.95(d)(2)**

**(d)(2)**

**(d)(2)(i)**

All continuous, intermittent and impulsive sound levels from 80 decibels to 130 decibels shall be integrated into the noise measurements.

**(d)(2)(ii)**

Instruments used to measure employee noise exposure shall be calibrated to ensure measurement accuracy.

**(d)(3)**

Monitoring shall be repeated whenever a change in production, process, equipment or controls increases noise exposures to the extent that:

**(d)(3)(i)**

Additional employees may be exposed at or above the action level; or

**(d)(3)(ii)**

The attenuation provided by hearing protectors being used by employees may be rendered inadequate to meet the requirements of paragraph (j) of this section.

**(e)**

"Employee notification." The employer shall notify each employee exposed at or above an 8-hour time-weighted average of 85 decibels of the results of the monitoring.

**(f)**

"Observation of monitoring." The employer shall provide affected employees or their representatives with an opportunity to observe any noise measurements conducted pursuant to this section.

**..1910.95(g)**

**(g)**

"Audiometric testing program."

**(g)(1)**

The employer shall establish and maintain an audiometric testing program as provided in this paragraph by making audiometric testing available to all employees whose exposures equal or exceed an 8-hour time-weighted average of 85 decibels.

**(g)(2)**

The program shall be provided at no cost to employees.

**(g)(3)**

Audiometric tests shall be performed by a licensed or certified audiologist, otolaryngologist, or other physician, or by a technician who is certified by the Council of Accreditation in Occupational Hearing Conservation, or who has satisfactorily demonstrated competence in administering audiometric examinations, obtaining valid audiograms, and properly using, maintaining and checking calibration and proper

functioning of the audiometers being used. A technician who operates microprocessor audiometers does not need to be certified. A technician who performs audiometric tests must be responsible to an audiologist, otolaryngologist or physician.

**(g)(4)**

All audiograms obtained pursuant to this section shall meet the requirements of Appendix C: "Audiometric Measuring Instruments."

**(g)(5)**

"Baseline audiogram."

**(g)(5)(i)**

Within 6 months of an employee's first exposure at or above the action level, the employer shall establish a valid baseline audiogram against which subsequent audiograms can be compared.

**..1910.95(g)(5)(ii)**

**(g)(5)(ii)**

"Mobile test van exception." Where mobile test vans are used to meet the audiometric testing obligation, the employer shall obtain a valid baseline audiogram within 1 year of an employee's first exposure at or above the action level. Where baseline audiograms are obtained more than 6 months after the employee's first exposure at or above the action level, employees shall wearing hearing protectors for any period exceeding six months after first exposure until the baseline audiogram is obtained.

**(g)(5)(iii)**

Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace noise. Hearing protectors may be used as a substitute for the requirement that baseline audiograms be preceded by 14 hours without exposure to workplace noise.

**(g)(5)(iv)**

The employer shall notify employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination.

**(g)(6)**

"Annual audiogram." At least annually after obtaining the baseline audiogram, the employer shall obtain a new audiogram for each employee exposed at or above an 8-hour time-weighted average of 85 decibels.

**(g)(7)**

"Evaluation of audiogram."

**(g)(7)(i)**

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 as defined in paragraph (g)(10) of this section has occurred. This comparison may be done by a technician.

**..1910.95(g)(7)(ii)**

**(g)(7)(ii)**

If the annual audiogram shows that an employee has suffered a standard threshold shift, the employer may obtain a retest within 30 days and consider the results of the retest as the annual audiogram.

**(g)(7)(iii)**

The audiologist, otolaryngologist, or physician shall review problem audiograms and shall determine whether there is a need for further evaluation. The employer shall provide to the person performing this evaluation the following information:

**(g)(7)(iii)(A)**

A copy of the requirements for hearing conservation as set forth in paragraphs (c) through (n) of this section;

**(g)(7)(iii)(B)**

The baseline audiogram and most recent audiogram of the employee to be evaluated;

**(g)(7)(iii)(C)**

Measurements of background sound pressure levels in the audiometric test room as required in Appendix D: Audiometric Test Rooms.

**(g)(7)(iii)(D)**

Records of audiometer calibrations required by paragraph (h)(5) of this section.

*..1910.95(g)(8)*

**(g)(8)**

"Follow-up procedures."

**(g)(8)(i)**

If a comparison of the annual audiogram to the baseline audiogram indicates a standard threshold shift as defined in paragraph (g)(10) of this section has occurred, the employee shall be informed of this fact in writing, within 21 days of the determination.

**(g)(8)(ii)**

Unless a physician determines that the standard threshold shift is not work related or aggravated by occupational noise exposure, the employer shall ensure that the following steps are taken when a standard threshold shift occurs:

**(g)(8)(ii)(A)**

Employees not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them.

**(g)(8)(ii)(B)**

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.

**(g)(8)(ii)(C)**

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.

**(g)(8)(ii)(D)**

The employee is informed of the need for an otological examination if a medical pathology of the ear that is unrelated to the use of hearing protectors is suspected.

*..1910.95(g)(8)(iii)*

**(g)(8)(iii)**

If subsequent audiometric testing of an employee whose exposure to noise is less than an 8-hour TWA of 90 decibels indicates that a standard threshold shift is not persistent, the employer:

**(g)(8)(iii)(A)**

Shall inform the employee of the new audiometric interpretation; and

**(g)(8)(iii)(B)**

May discontinue the required use of hearing protectors for that employee.

**(g)(9)**

"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:

**(g)(9)(i)**

The standard threshold shift revealed by the audiogram is persistent; or

**(g)(9)(ii)**

The hearing threshold shown in the annual audiogram indicates significant improvement over the baseline audiogram.

**(g)(10)**

"Standard threshold shift."

**(g)(10)(i)**

As used in this section, a standard threshold shift is 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.

**..1910.95(g)(10)(ii)**

**(g)(10)(ii)**

In determining whether a standard threshold shift has occurred, allowance may be made for the contribution of aging (presbycusis) to the change in hearing level by correcting the annual audiogram according to the procedure described in Appendix F: "Calculation and Application of Age Correction to Audiograms."

**(h)**

"Audiometric test requirements."

**(h)(1)**

Audiometric tests shall be pure tone, air conduction, hearing threshold examinations, with test frequencies including as a minimum 500, 1000, 2000, 3000, 4000, and 6000 Hz.

Tests at each frequency shall be taken separately for each ear.

**(h)(2)**

Audiometric tests shall be conducted with audiometers (including microprocessor audiometers) that meet the specifications of, and are maintained and used in accordance with, American National Standard Specification for Audiometers, S3.6-1969, which is incorporated by reference as specified in Sec. 1910.6.

**(h)(3)**

Pulsed-tone and self-recording audiometers, if used, shall meet the requirements specified in Appendix C: "Audiometric Measuring Instruments."

**(h)(4)**

Audiometric examinations shall be administered in a room meeting the requirements listed in Appendix D: "Audiometric Test Rooms."

**..1910.95(h)(5)**

**(h)(5)**

"Audiometer calibration."

**(h)(5)(i)**

The functional operation of the audiometer shall be checked before each day's use by testing a person with known, stable hearing thresholds, and by listening to the audiometer's output to make sure that the output is free from distorted or unwanted sounds. Deviations of 10 decibels or greater require an acoustic calibration.

**(h)(5)(ii)**

Audiometer calibration shall be checked acoustically at least annually in accordance with Appendix E: "Acoustic Calibration of Audiometers." Test frequencies below 500 Hz and above 6000 Hz may be omitted from this check. Deviations of 15 decibels or greater require an exhaustive calibration.

**(h)(5)(iii)**

An exhaustive calibration shall be performed at least every two years in accordance with sections 4.1.2; 4.1.3.; 4.1.4.3; 4.2; 4.4.1; 4.4.2; 4.4.3; and 4.5 of the American National Standard Specification for Audiometers, S3.6-1969. Test frequencies below 500 Hz and above 6000 Hz may be omitted from this calibration.

**(i)**

"Hearing protectors."

**(i)(1)**

Employers shall make hearing protectors available to all employees exposed to an 8-hour time-weighted average of 85 decibels or greater at no cost to the employees. Hearing protectors shall be replaced as necessary.

**(i)(2)**

Employers shall ensure that hearing protectors are worn:

**(i)(2)(i)**

By an employee who is required by paragraph (b)(1) of this section to wear personal protective equipment; and

*..1910.95(i)(2)(ii)*

**(i)(2)(ii)**

By any employee who is exposed to an 8-hour time-weighted average of 85 decibels or greater, and who:

**(i)(2)(ii)(A)**

Has not yet had a baseline audiogram established pursuant to paragraph (g)(5)(ii); or

**(i)(2)(ii)(B)**

Has experienced a standard threshold shift.

**(i)(3)**

Employees shall be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors provided by the employer.

**(i)(4)**

The employer shall provide training in the use and care of all hearing protectors provided to employees.

**(i)(5)**

The employer shall ensure proper initial fitting and supervise the correct use of all hearing protectors.

**(j)**

"Hearing protector attenuation."

**(j)(1)**

The employer shall evaluate hearing protector attenuation for the specific noise environments in which the protector will be used. The employer shall use one of the evaluation methods described in Appendix B: "Methods for Estimating the Adequacy of Hearing Protection Attenuation."

**..1910.95(j)(2)**

**(j)(2)**

Hearing protectors must attenuate employee exposure at least to an 8-hour time-weighted average of 90 decibels as required by paragraph (b) of this section.

**(j)(3)**

For employees who have experienced a standard threshold shift, hearing protectors must attenuate employee exposure to an 8-hour time-weighted average of 85 decibels or below.

**(j)(4)**

The adequacy of hearing protector attenuation shall be re-evaluated whenever employee noise exposures increase to the extent that the hearing protectors provided may no longer provide adequate attenuation. The employer shall provide more effective hearing protectors where necessary.

**(k)**

"Training program."

**(k)(1)**

The employer shall institute a training program for all employees who are exposed to noise at or above an 8-hour time-weighted average of 85 decibels, and shall ensure employee participation in such program.

**(k)(2)**

The training program shall be repeated annually for each employee included in the hearing conservation program. Information provided in the training program shall be updated to be consistent with changes in protective equipment and work processes.

**(k)(3)**

The employer shall ensure that each employee is informed of the following:

*..1910.95(k)(3)(i)*

**(k)(3)(i)**

The effects of noise on hearing;

**(k)(3)(ii)**

The purpose of hearing protectors, the advantages, disadvantages, and attenuation of various types, and instructions on selection, fitting, use, and care; and

**(k)(3)(iii)**

The purpose of audiometric testing, and an explanation of the test procedures.

**(l)**

"Access to information and training materials."

**(l)(1)**

The employer shall make available to affected employees or their representatives copies of this standard and shall also post a copy in the workplace.

**(l)(2)**

The employer shall provide to affected employees any informational materials pertaining to the standard that are supplied to the employer by the Assistant Secretary.

**(l)(3)**

The employer shall provide, upon request, all materials related to the employer's training and education program pertaining to this standard to the Assistant Secretary and the Director.

**..1910.95(m)**

**(m)**

"Recordkeeping" -

**(m)(1)**

"Exposure measurements." The employer shall maintain an accurate record of all employee exposure measurements required by paragraph (d) of this section.

**(m)(2)**

"Audiometric tests."

**(m)(2)(i)**

The employer shall retain all employee audiometric test records obtained pursuant to paragraph (g) of this section:

**(m)(2)(ii)**

This record shall include:

**(m)(2)(ii)(A)**

Name and job classification of the employee;

**(m)(2)(ii)(B)**

Date of the audiogram;

**(m)(2)(ii)(C)**

The examiner's name;

**(m)(2)(ii)(D)**

Date of the last acoustic or exhaustive calibration of the audiometer; and

**(m)(2)(ii)(E)**

Employee's most recent noise exposure assessment.

**(m)(2)(ii)(F)**

The employer shall maintain accurate records of the measurements of the background sound pressure levels in audiometric test rooms.

**(m)(3)**

"Record retention." The employer shall retain records required in this paragraph (m) for at least the following periods.

**..1910.95(m)(3)(i)**

**(m)(3)(i)**

Noise exposure measurement records shall be retained for two years.

**(m)(3)(ii)**

Audiometric test records shall be retained for the duration of the affected employee's employment.

**(m)(4)**

"Access to records." All records required by this section shall be provided upon request to employees, former employees, representatives designated by the individual employee, and the Assistant Secretary. The provisions of 29 CFR 1910.20 (a)-(e) and (g)-

**(m)(4)(i)**

apply to access to records under this section.

**(m)(5)**

"Transfer of records." If the employer ceases to do business, the employer shall transfer to the successor employer all records required to be maintained by this section, and the successor employer shall retain them for the remainder of the period prescribed in paragraph (m)(3) of this section.

**(n)**

"Appendices."

**(n)(1)**

Appendices A, B, C, D, and E to this section are incorporated as part of this section and the contents of these appendices are mandatory.

**..1910.95(n)(2)**

**(n)(2)**

Appendices F and G to this section are informational and are not intended to create any additional obligations not otherwise imposed or to detract from any existing obligations.

**(o)**

"Exemptions." Paragraphs (c) through (n) of this section shall not apply to employers engaged in oil and gas well drilling and servicing operations.


**(p)**

"Startup date." Baseline audiograms required by paragraph (g) of this section shall be completed by March 1, 1984.

[39 FR 23502, June 27, 1974, as amended at 46 FR 4161, Jan. 16, 1981; 46 FR 62845, Dec. 29, 1981; 48 FR 9776, Mar. 8, 1983; 48 FR 29687, June 28, 1983; 54 FR 24333, June 7, 1989; 61 FR 5507, Feb. 13, 1996; 61 FR 9227, March 7, 1996]


## Appendix C

### Sound Level Survey Information Sheet

 <b>Environmental Health &amp; Safety</b>	<b>Sound Level Screening Information Sheet</b>
<b>General Information</b>	
Building Name:	Date:
Room Number:	Main Contact:
Department:	Phone Number:
<b>Screening Information</b>	
Employee Name(s):	Job Title(s):
Activity/Noise Source:	
Time of Exposure (daily):	
<b>Duration of Monitoring &amp; Reading Levels</b>	
-In the hearing zone:	
-Next to the noise source(s):	
-At the entrance to the work area:	
-At other locations where the employee may be working:	
<b>Rough sketch of where readings were obtained:</b>	

## Appendix D

### Personal Noise Monitoring Data Collection Form

 <b>Environmental Health &amp; Safety</b>	<b>Personal Noise Monitoring Data Collection Form</b>
<b>General Information</b>	
Building Name:	Date:
Room Number:	Employee Name:
Department:	Job Title:
<b>Monitoring Information</b>	
Time of Monitoring:	
Description of work performed:	
Location(s) of work performed:	
Note any unusual job activities or additional information:	
Employee Signature:	
Evaluators Name:	