Chapter 18

Hearing Conservation

Chapter Outline

1 Overview
   1.1 Hazards/Impacts

2 Scope
   2.1 Exemptions

3 Standards

4 Definitions

5 Requirements
   5.1 General
      5.1.1 Hazard Recognition
      5.1.2 Noise Surveys
      5.1.3 Equipment
      5.1.4 Designated Noise Areas
      5.1.5 Personnel
      5.1.6 Recordkeeping
      5.1.7 Roles and Responsibilities
   5.2 Procedures and Specific Requirements
      5.2.1 Hazard Recognition
   5.3 Training

6 Exhibits

7 References

8 Implementation

9 Ownership

This chapter was last reviewed for currency 4/3/2015. The next thorough review is due 4/3/2018.
1 Overview

This chapter establishes requirements for reducing noise and protecting SLAC personnel who may be exposed to excessive noise levels. These requirements are based on the Occupational Safety and Health Administration Hearing Conservation Program described in the Code of Federal Regulations (29 CFR 1910.95 and 29 CFR 1926.52) and the threshold limit values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH) (see Section 4, “Definitions”).

The hearing conservation program involves:
- Identification of exposed personnel (area and personal monitoring)
- Implementation of noise-reducing engineering and administrative controls
- Audiometric testing (baseline and annual)
- Training
- Use of hearing protectors (earplugs, ear muffs)

1.1 Hazards/Impacts

Exposure to excessive noise in the workplace may cause permanent or temporary hearing loss, tinnitus (ringing of the ears), impaired verbal communication, fatigue, work errors, and various stress reactions such as an increase in blood pressure. Noise may also cause annoyance or difficulty in communicating or working effectively and safely. The potential for harmful effects increases with both the intensity and the duration of the noise exposure. Excessive noise in the workplace may be produced by equipment such as motors, air hammers, generators, heavy machinery, and other common industrial processes. Nuisance noises are not usually intense enough to cause hearing loss, but they can interfere with verbal communication. The hearing conservation program at SLAC is designed to protect personnel from hearing loss caused by occupational exposure to excessive noise.

2 Scope

This chapter covers all industrial operations and workplaces at SLAC. Employees, university collaborators, users, scientists, fellows, students, and faculty are included in noise surveys and audiometric testing as needed to ensure a safe work environment.

This chapter applies to SLAC workers (as described above) who may be exposed to excessive noise levels in both construction and non-construction activities.

SLAC casual visitors and other types of subcontractors are excluded from the requirements of this chapter. Subcontracting companies are expected to follow their own hearing conservation program in compliance with 29 CFR 1910.95 and 29 CFR 1926.52 (see Section 3, “Standards”).
2.1 Exemptions

There are no exemptions to the requirements of this chapter.

3 Standards

The hearing conservation program has adopted the following standards:

- Title 10, *Code of Federal Regulations*, “Energy”\(^1\)
  - Part 851, “Worker Safety and Health Program” (10 CFR 851)\(^2\)
  - Section 95, “Occupational Noise Exposure” (29 CFR 1910.95)\(^3\)
  - Section 52, “Occupational Noise Exposure” (29 CFR 1926.52)\(^4\)
- DOE Order 440.1A, “Worker Protection Management for DOE Federal and Contractor Employees”\(^5\)
- American Conference of Governmental Industrial Hygienists (ACGIH), “Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs)”, (ACGIH TLVs and BEIs – 2006)\(^6\)
- American National Standards Institute (ANSI), S3.6-2004, “Specification for Audiometers” (ANSI S3.6-2004)\(^7\)

4 Definitions

*Audiometer.* An instrument for gauging and recording acuity of hearing

---

2 As of January 2007, 10 CFR 851 has not been published in the *Code of Federal Regulations*, but the final rule is available from the following site: “Worker Safety and Health Program Final Rule - 10 CFR 851”, [http://www.eh.doe.gov/health/rule851/851final.html](http://www.eh.doe.gov/health/rule851/851final.html)
Audiometric test. A clinical evaluation of a person’s hearing capability, using a calibrated pure-tone audiometer and performed in accordance with 29 CFR 1910.958 (g) and (h). At SLAC, such tests are provided on site by the Medical Department.

Casual visitor. Individual coming to the SLAC campus for a period of no more than 30 days per visit, whose visit does not involve unescorted entry to industrial/accelerator or other areas where unique SLAC hazards warrant limited access, and whose visit is for the following types of purposes: attending public lectures, public tours, or other activities open to the public; attending workshops, conferences, and collaboration meetings; use of the Linear Cafe (SLAC cafeteria); use of the Stanford Guesthouse; and meetings with SLAC personnel.

Decibels-A-weighted scale (dBA). The unit in which sound levels are measured for expressing the relative intensity of sounds on a scale from zero for the average least perceptible sound to about 130 for the average pain level in humans.

Designated noise area. A work area with an eight-hour TWA of 85 dBA or higher, or with periodic impact noise of 115 dBA or higher as surveyed and posted by the SLAC hearing conservation program.

Hearing protection/protectors. Devices worn in or on the ears to reduce exposure to noise. May include disposable earplugs, reusable earplugs (banded and corded), and earmuffs.

Impact noise. A noise that occurs at intervals of greater than one per second; for example, the noise made by a metal shear. Personnel must not be exposed to impact noises exceeding 140 dBA peak sound pressure.

Noise dosimetry. The process or method of measuring a person’s individual exposure to noise over a given time period.

Noise reduction rating (NNR). Measure of the estimated attenuation capacity of a hearing protector to represent the approximate noise reduction, in dBA.

Otological. Relating to otology, the branch of medicine that deals with the structure, function, and pathology of the ear.

Permissible noise exposure. At SLAC, an eight-hour time-weighted average of 85 dBA.

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. Units in decibels (dB).

Sound level meter. A hand-held, direct-reading instrument with a microphone, an electronic-filter network, and a visual display such as a meter or digital readout. Because sound-level meters provide a real-time indication of noise intensity, they are typically used to survey an area.

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

Threshold limit value (TLV). Recommended health-based guidelines for occupational exposure to noise levels published by the American Conference of Governmental Industrial Hygienists (ACGIH). TLVs for noise represent the sound pressure levels and durations of exposure that represent conditions under which it
is believed that nearly all workers may be repeatedly exposed without adverse effect on their ability to hear 
and understand normal speech.

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

5 Requirements

5.1 General

Successful implementation of the hearing conservation program supports a safe and healthy work 
environment by

- Anticipating, recognizing, and evaluating noise hazards before they exist
- Implementing recommended engineering controls where feasible (reducing machine noise using 
dampeners, insulation, isolation, distance)
- Implementing administrative controls (wearing hearing protection, limiting exposure time, training, 
medical surveillance) when engineering controls are not feasible
- Surveying work areas to identify noise hazards and taking appropriate measures to reduce them

The hearing conservation program is coordinated by the hearing conservation program manager within the 
Chemical and General Safety (CGS) Department in the Environment, Safety, and Health (ES&H) Division. 
Noise surveys may be performed by a qualified technician, but the process must be overseen by a Chemical 
and General Safety Department industrial hygienist. The industrial hygiene program manager is also 
available to evaluate and assist in noise reduction efforts, effective work practices, and hearing protector 
selection and usage.

5.1.1 Hazard Recognition

The hearing conservation program consists of identifying and properly evaluating and identifying noise 
hazards, then providing recommendations to reduce the potential for exposure and improve health in the 
workplace. (See Hearing Conservation: Hazard Recognition Requirements.⁹)

5.1.2 Noise Surveys

The hearing conservation program manager must perform baseline noise surveys and periodic resurveys of 
work areas and operations as needed to identify and evaluate high noise areas and activities. Surveys may 
include sound level measurement in the general work area as well as personal noise dosimetry.

Noise surveys may occur as a result of

1. Individuals or managers submitting a request to the hearing conservation program manager

---

2. Design review processes
3. Requirements of regulations, SLAC policy, or agreements with the DOE

(See Hearing Conservation: Noise Survey Guidelines.\textsuperscript{10})

5.1.2.1 Methods

The SLAC hearing conservation program manager conducts monitoring according to guidelines published by the American Conference of Governmental Industrial Hygienists (ACGIH), “Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs)”, (ACGIH TLVs and BEIs – 2006)\textsuperscript{11} with equipment maintained and calibrated according to manufacturers’ recommendations.

5.1.2.2 Results

Reports

After performing an area noise survey, the hearing conservation program manager must write a detailed report which

- Describes the tasks and locations where noise survey occurred
- Identifies workers monitored or represented by the survey
- Describes control measures in place during the survey (including the use of hearing protectors)
- Notes any factors that may have affected noise data recorded (if applicable)
- Provides an interpretation of the results

If applicable, recommendations to reduce potential or actual exposures and requirements for completing personnel training and medical monitoring will be included in the report.

The hearing conservation program manager sends the report to the supervisor of the area. The supervisor is responsible for distributing the report to affected employees.

Personal Noise Dosimetry

If SLAC personnel are the subject of noise dosimetry, the hearing conservation program manager develops a personal notification memo and sends it in a timely manner directly to the affected persons.


\textsuperscript{11} See the SLAC Library, \url{http://www.slac.stanford.edu/library/}, for available standards. A hard copy is available; see \url{http://www.slac.stanford.edu/spires/find/books/www?key=344010}
5.1.3 Equipment

5.1.3.1 Service and Calibration

Noise Survey and Calibration Equipment

Noise survey and calibration equipment must be maintained, serviced, and calibrated according to manufacturer recommendations. Equipment must be sent out for factory service and calibration at a frequency established by the manufacturer. Certain equipment is also checked for accurate calibration on site by the industrial hygienist or technician before and after each use (such as for sound level meters).

The equipment must be marked with a sticker or tag indicating the most recent calibration date, and when calibration is due again. Before- and after-use calibrations by the hearing conservation program manager need not be marked on the unit.

Equipment that is broken, inaccurate, or past-due for calibration must be tagged out of service until repaired or recalibrated. The tag should provide the date, the person’s name, reason the unit was taken out of service, and the planned disposition of the unit.

Audiometric Testing Equipment

In accordance with 29 CFR 1910.95 (h)(5),12 audiometric testing equipment must be
- Checked before each day’s use
- Acoustically calibrated at least annually
- Fully calibrated at least every two years

The equipment must be marked with a sticker or tag indicating the most recent calibration date, the type of calibration, and when calibration is due again. Before-use calibrations by Medical Department staff need not be marked on the unit.

Equipment that is broken, inaccurate, or past-due for calibration must be tagged out of service until repaired or recalibrated. The tag should provide the date, the person’s name, reason the unit was taken out of service, and the planned disposition of the unit.

5.1.3.2 Storage

Noise survey and audiometry equipment must be properly stored in a secured, clean location, away from light, dust, and other contaminants.

5.1.4 Designated Noise Areas

The following requirements apply to designated noise areas:
- Effective hazard warning signs must be posted at all entrances to the area. There are no specific requirements for the wording on the sign; however it must clearly state the noise hazard and requirements of the area. (See Hearing Conservation: Sample Designated Noise Area Warning Sign.13)

- The hearing conservation program manager must resurvey designated noise areas whenever notified that changing conditions (such as the addition or relocation of equipment) may increase noise levels.

- Personnel who routinely work in designated noise areas must undergo baseline and annual audiometric tests by enrolling in ES&H Course 222ME, Hearing Conservation Medical Exam. (See Section 5.1.5.3, “Medical Surveillance – Audiometric Tests”.)

(See Hearing Conservation: Designated Noise Area List.14)

5.1.5 Personnel

5.1.5.1 Qualifications

Noise surveys may be performed by a qualified technician, but the process must be overseen by a Chemical and General Safety Department industrial hygienist.

5.1.5.2 Personnel Protective Equipment – Hearing Protectors

Personnel working in designated noise areas must be provided with and properly wear appropriate personnel protective equipment in the form of hearing protectors when equipment is operating. Various types of hearing protectors can be acquired in SLAC Stores.15 The Medical Department will supply and fit custom-molded earplugs for personnel who, for medical reasons, cannot use standard, disposable earplugs or earmuffs.

Hearing protectors have a noise reduction rating (NRR) number as specified by the manufacturer on the packaging. The NRR is a general guide to the level of noise reduction (in decibels) the protector provides in laboratory test situations if it is fitted and worn properly. To determine the effective noise reduction of a hearing protector used in the workplace, subtract 7 dB from the NRR.

Personnel must follow manufacturers’ instructions for cleaning, wearing and storing hearing protectors.

If hearing protectors are the reusable type (such as ear muffis or banded ear plugs), a convenient place must be provided for personnel to store them properly, away from the potential for physical damage, dust, and other contaminants. It is recommended they be stored in a sealed plastic bag, within a locker or desk drawer or tool box.

Disposable hearing protectors (such as disposable ear plugs) must be discarded after each use.

5.1.5.3 Medical Surveillance – Audiometric Tests

Personnel who routinely work in designated noise areas must undergo baseline and annual audiometric tests by enrolling in ES&H Course 222ME, Hearing Conservation Medical Exam.16

---


16 https://www-internal.slac.stanford.edu/esh-db/training/slaconly/bin/catalog_item.asp?course=222ME
Personnel who perform a brief task or job in a designated noise area are not required to take an audiometric test; however, they must wear hearing protection while they work there.

The SLAC Medical Department performs all required audiometric tests at no cost to personnel as part of the medical surveillance program (see Chapter 3, “Medical”). The SLAC Training Assessment (STA)18 triggers baseline and annual audiometric tests for personnel. Prior to their audiometric test, personnel must avoid noisy environments (or properly wear hearing protectors) for 14 hours.

The hearing conservation program manager may recommend medical surveillance for certain employees when a survey indicates a potential over-exposure to high noise levels. This recommendation is provided in writing to employees and their supervisors, usually within the contents of a noise survey report or personal notification memo.

Audiometric testing performed for SLAC personnel must meet the requirements of 29 CFR 1910.95 (g) and (h).19

5.1.6 Recordkeeping

5.1.6.1 Noise Survey Reports and Personal Notifications

Paper copies of noise survey reports and personal notifications must be kept on file for a minimum of two years. They are located in the CGS Department and are indexed for easy retrieval.

5.1.6.2 Equipment Calibration Logs and Records

The hearing conservation program manager maintains an equipment calibration inventory. This identifies all hearing conservation program-owned noise survey equipment, the date of most recent calibration, and the next calibration due date.

The Medical Department is responsible for tracking the calibration dates and service records (as needed) of audiometric testing equipment.

5.1.6.3 Audiometric Test Results

Paper copies of audiometric test results must be maintained on file for the duration of the affected person’s employment. The Medical Department maintains these records.

5.1.7 Roles and Responsibilities

5.1.7.1 Hearing Conservation Program Manager

The hearing conservation program manager will

Conduct noise surveys and identify designated noise areas
Recommend designated noise area warning signs where appropriate
Measure and evaluate noise hazards when requested by managers or personnel
Notify supervisors and personnel of noise survey or dosimetry results
Recommend protective measures to minimize exposure of personnel to hazardous noise levels
Assist in the selection of signage to identify visually designated noise areas
Review plans for new operations and significant changes to ongoing operations as needed to control noise levels
Properly maintain noise level meters, dosimeters, and calibration equipment
Maintain noise level survey records, personal notification memos, and equipment calibration logs
Oversee subcontractor activities as they relate to hearing conservation

5.1.7.2 Medical Department

The Medical Department will

- Administer baseline and annual audiometric tests to personnel who work in posted designated noise areas as identified by the hearing conservation program manager (baseline to be completed before they start work in that area)
- Maintain records of audiometric tests of all personnel for the duration of the person’s employment
- Notify personnel when they are overdue for an audiometric test
- Contact personnel and scheduling audiometric tests when they are late in reporting for their required audiometric test
- Evaluate the results of the audiometric test and providing them, in writing directly to personnel tested and their supervisors
- Supply and fit custom-molded earplugs for personnel who, for medical reasons, cannot use standard, disposable earplugs or earmuffs
- Refer the person for a clinical audiological evaluation or an otological exam by a specializing physician within 30 days of the detection of a standard threshold shift or other abnormal audiometric test result
- Ensure that audiometric equipment is stored, checked and calibrated according to Section 5.1.3, “Equipment”, of this chapter

5.1.7.3 Managers and Supervisors

Managers and supervisors will

- Ensure the hearing conservation program manager has evaluated their work areas as required to identify designated noise areas

---

20 All audiometric testing and evaluation must be conducted in accordance with 29 CFR 1910.95 (g) and (h).
- Contact the hearing conservation program manager when there is any change in production, process, or equipment that may increase noise levels
- Ensure that designated noise areas are clearly posted with warning signs
- Ensure that personnel wear hearing protection properly when working in designated noise areas
- Notify the Medical Department when new personnel are hired for jobs in designated noise areas, or when personnel are transferred into designated noise areas
- Ensure that personnel who work in designated noise areas are enrolled in and successfully complete ES&H Course 222, Hearing Conservation, and ES&H Course 222ME, Hearing Conservation Medical Exam, and annually thereafter
- Forward area noise survey reports to affected personnel

5.1.7.4 Personnel

Personnel who work in designated noise areas will
- Notify their manager or supervisor if they suspect that a noise level is hazardous
- Properly utilize hearing protectors in designated noise areas and during activities that generate high noise levels
- Properly store hearing protectors
- Successfully complete ES&H Course 222, Hearing Conservation, and ES&H Course 222ME, Hearing Conservation Medical Exam
- Obtain a follow-up audiometric evaluation or otological exam if recommended by the SLAC Medical Department

5.2 Procedures and Specific Requirements

The following are required for this program. For a full list of implementing documents, see Section 6, “Exhibits”.

5.2.1 Hazard Recognition

Requirements for recognizing high noise areas, including responsibilities and noise standards (see Hearing Conservation: Hazard Recognition Requirements)

---

21 [https://www-internal.slac.stanford.edu/esh-db/training/slaconly/bin/catalog_item.asp?course=222](https://www-internal.slac.stanford.edu/esh-db/training/slaconly/bin/catalog_item.asp?course=222)
22 [https://www-internal.slac.stanford.edu/esh-db/training/slaconly/bin/catalog_item.asp?course=222ME](https://www-internal.slac.stanford.edu/esh-db/training/slaconly/bin/catalog_item.asp?course=222ME)
23 [https://www-internal.slac.stanford.edu/esh-db/training/slaconly/bin/catalog_item.asp?course=222](https://www-internal.slac.stanford.edu/esh-db/training/slaconly/bin/catalog_item.asp?course=222)
24 [https://www-internal.slac.stanford.edu/esh-db/training/slaconly/bin/catalog_item.asp?course=222ME](https://www-internal.slac.stanford.edu/esh-db/training/slaconly/bin/catalog_item.asp?course=222ME)
5.3 Training

The following courses are required for personnel who routinely work in a designated noise area:

- ES&H Course 222, Hearing Conservation (annually)\textsuperscript{26}
- ES&H Course 222ME, Hearing Conservation Medical Exam (annually)\textsuperscript{27}

Personnel who perform a brief task or job in a designated noise area are not required to complete hearing conservation training or an audiometric test; however, they should wear hearing protection while they work there.

Managers and supervisors must ensure that personnel are fully trained regarding occupational hazards and must occasionally provide on-the-job training. Consult the SLAC Training Assessment to determine personnel training requirements.\textsuperscript{28}

6 Exhibits

- Hearing Conservation: Implementation Plan (SLAC-I-730-0A09M-005)\textsuperscript{29}
- Hearing Conservation: Hazard Recognition Requirements (SLAC-I-730-0A09S-022)\textsuperscript{30}
- Hearing Conservation: Noise Survey Guidelines (SLAC-I-730-0A09T-021)\textsuperscript{31}
- Hearing Conservation: Sample Designated Noise Area Warning Sign (SLAC-I-730-0A09S-023)\textsuperscript{32}
- Hearing Conservation: Designated Noise Area List (SLAC-I-730-0A09V-002)\textsuperscript{33}

7 References

*SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)*\textsuperscript{34}

- Chapter 3, “Medical”\textsuperscript{35}

\textsuperscript{26} [https://www-internal.slac.stanford.edu/esh-db/training/slaconly/bin/catalog_item.asp?course=222](https://www-internal.slac.stanford.edu/esh-db/training/slaconly/bin/catalog_item.asp?course=222)
\textsuperscript{27} [https://www-internal.slac.stanford.edu/esh-db/training/slaconly/bin/catalog_item.asp?course=222ME](https://www-internal.slac.stanford.edu/esh-db/training/slaconly/bin/catalog_item.asp?course=222ME)
\textsuperscript{28} “Training - SLAC Training Assessment”, [http://www-group.slac.stanford.edu/esh/training/sta/default.htm](http://www-group.slac.stanford.edu/esh/training/sta/default.htm)
\textsuperscript{34} [http://www-group.slac.stanford.edu/esh/eshmanual/](http://www-group.slac.stanford.edu/esh/eshmanual/)
Chapter 18: Hearing Conservation

- Chapter 19, “Personal Protective Equipment”36
- Chapter 24, “Training”37

Other
- Occupational Safety and Health Administration (OSHA), *OSHA Technical Manual*, Chapter 5, “Noise and Hearing Conservation” (TED 01-00-015 [TED 1-0.15A])38

Other laboratories

8 Implementation

The requirements of this chapter will be implemented according to the schedule in Hearing Conservation: Implementation Plan.41

9 Ownership

Department: Chemical and General Safety

Program: Hearing Conservation

Owner: Program Manager, John Shepardson

35 [http://www-group.slac.stanford.edu/esh/medical/chapter/policies.htm](http://www-group.slac.stanford.edu/esh/medical/chapter/policies.htm)
37 [http://www-group.slac.stanford.edu/esh/training/chapter/policies.htm](http://www-group.slac.stanford.edu/esh/training/chapter/policies.htm)
40 [http://www.lbl.gov/ehs/pub3000/CH04.html](http://www.lbl.gov/ehs/pub3000/CH04.html)
# Hearing Conservation: Implementation Plan

Department: Chemical and General Safety  
Program: Hearing Conservation  
Owner: Program Manager, John Shepardson  
Authority: ES&H Manual, Chapter 18, Hearing Conservation

The requirements of Chapter 18, “Hearing Conservation”, will be phased in according to the following schedule.

<table>
<thead>
<tr>
<th>Section Number</th>
<th>Section Title</th>
<th>Requirement Note</th>
<th>Effective Date</th>
<th>Schedule Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Requirements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>General</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1.1</td>
<td>Hazard Recognition</td>
<td></td>
<td>Immediate</td>
<td></td>
</tr>
<tr>
<td>5.1.2</td>
<td>Noise Surveys</td>
<td></td>
<td>Immediate</td>
<td></td>
</tr>
<tr>
<td>5.1.3</td>
<td>Equipment</td>
<td></td>
<td>Immediate</td>
<td></td>
</tr>
<tr>
<td>5.1.4</td>
<td>Designated Noise Areas</td>
<td>Posting replaces “high noise areas”</td>
<td>Completion 9/30/2007</td>
<td>New requirement</td>
</tr>
<tr>
<td>5.1.5</td>
<td>Personnel</td>
<td></td>
<td>Immediate</td>
<td></td>
</tr>
<tr>
<td>5.1.6</td>
<td>Recordkeeping</td>
<td></td>
<td>Immediate</td>
<td></td>
</tr>
<tr>
<td>5.1.7</td>
<td>Roles and Responsibilities</td>
<td></td>
<td>Immediate</td>
<td></td>
</tr>
<tr>
<td>5.2</td>
<td>Procedures and Specific</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Requirements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.2.1</td>
<td>Hazard Recognition</td>
<td></td>
<td>Immediate</td>
<td></td>
</tr>
<tr>
<td>5.2.2</td>
<td>Noise Surveys</td>
<td></td>
<td>Immediate</td>
<td></td>
</tr>
<tr>
<td>5.3</td>
<td>Training</td>
<td></td>
<td>Immediate</td>
<td></td>
</tr>
</tbody>
</table>
Hearing Conservation: Hazard Recognition Requirements

Department: Chemical and General Safety
Program: Hearing Conservation
Owner: Program Manager, John Shepardson
Authority: ES&H Manual, Chapter 18, Hearing Conservation

Proper implementation of the hearing conservation program protects personnel from the hazards of over-exposure to high noise levels. An initial step in the program is hazard recognition.

**Identifying High Noise Areas**

The following conditions may indicate the presence of a hazardous noise level:

- It is difficult to hear someone speak when they are less than three feet away from you.
- You must raise your voice considerably to be heard due to noise interference.
- Impact noises (at intervals greater than 1 second) cause discomfort when heard.
- Ordinary noises sound muffled to you after you have finished a work shift.

Personnel must inform their manager or supervisor if they suspect that a noise level is hazardous.

Managers and supervisors must contact the hearing conservation program manager when

- Personnel inform them of a possible noise hazard.
- They suspect that a noise in their area may be hazardous.
- There is a change in production, process, equipment, or controls that may increase noise levels in their area.

Upon notification, an industrial hygienist will conduct a noise survey of the affected area. As a part of the survey, the industrial hygienist may request that personnel working in the area wear a noise dosimeter (see Hearing Conservation: Noise Survey Guidelines\(^1\))

If survey results indicate a noise hazard, the industrial hygienist will notify the manager or supervisor, recommend appropriate protective measures for personnel in the area, and require their enrollment in the SLAC hearing conservation training course and audiometric testing.

**Recognizing Hazards**

Industrial hygienists identify potential noise hazards by

- Maintaining familiarity with SLAC processes

---

Hearing Conservation: Hazard Recognition Requirements

- Reviewing pre-work hazard analysis (PWHA) and job hazard analysis and mitigation (JHAM) documents as needed to identify activities generating high noise levels
- Surveying existing conditions
- Conducting individual and work area noise surveys in locations where noise-producing equipment operates

**Standards for Occupational Noise Exposure**

The standards for occupational noise exposure adopted by the DOE state that personnel without hearing protection must not be exposed to an intensity of noise exceeding 85 dBA based on an eight-hour time-weighted average (TWA) as measured on the A-weighted scale. This means that if personnel are working in an area where the intensity of noise exceeds an average of 85 dBA over eight hours, the amount of time that they may work in the area without hearing protection must be reduced in relation to the amount that the noise exceeds 85 dBA.

For example, if the noise in an area is measured at an average of 88 dBA over an eight-hour period, personnel may only work in that area without wearing hearing protection for a maximum of four hours. According to this standard, personnel may work a full eight-hour shift without hearing protection in an area where the noise level does not exceed an eight-hour TWA of 85 dBA.

SLAC policy is more protective than this standard, and requires that all personnel who routinely work in an area where there is continuous noise above 85 dBA wear hearing protection at all times. SLAC is required to inform personnel of the standards shown in Table 1 below.

<table>
<thead>
<tr>
<th>Noise Level (dBA)</th>
<th>Duration (Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>24</td>
</tr>
<tr>
<td>82</td>
<td>16</td>
</tr>
<tr>
<td>85</td>
<td>8</td>
</tr>
<tr>
<td>88</td>
<td>4</td>
</tr>
<tr>
<td>91</td>
<td>2</td>
</tr>
<tr>
<td>94</td>
<td>1</td>
</tr>
<tr>
<td>97</td>
<td>1/2</td>
</tr>
<tr>
<td>100</td>
<td>1/4</td>
</tr>
<tr>
<td>103</td>
<td>1/8</td>
</tr>
</tbody>
</table>

* Includes impact noise

Hearing Conservation: Noise Survey Guidelines

Department: Chemical and General Safety
Program: Hearing Conservation
Owner: Program Manager, John Shepardson
Authority: ES&H Manual, Chapter 18, Hearing Conservation

The hearing conservation program manager must perform baseline noise surveys and periodic resurveys of work areas and operations as needed to identify and evaluate high noise areas and activities. Surveys may include sound level measurement in the general work area as well as personal noise dosimetry.

Noise surveys may occur as a result of

- Individuals or managers submitting a request to the hearing conservation program manager
- Design review processes
- Regulatory requirements, SLAC policy, or agreements with the DOE

**Types of Monitoring**

**Personal Noise Dosimetry**

Industrial hygienists use noise dosimetry to measure personnel exposure to noise levels through the work day. Noise levels surrounding the individual are measured and recorded over an eight-hour period (or for the full work shift). The industrial hygienist also observes and records general information about personnel work processes.

**Area Noise Level Monitoring**

Industrial hygienists measure and record noise levels in a general work area to determine the extent of noise exposure or to measure the effectiveness of engineering controls applied to a machine (such as dampeners, insulation, isolation, distance). The noise level meter is placed in a fixed location in the work area or near the source of the noise.

**Obtaining Noise Surveys**

Noise surveys may take place as a result of the following.

**Individual Requests**

Personnel at SLAC should discuss noise level concerns with their supervisors, then contact the hearing conservation program manager to request monitoring.

The requestor or area manager must notify the hearing conservation program manager when there are changes in production, process, equipment or controls that increase noise exposures. The hearing conservation program manager arranges for evaluation and monitoring of the work environment based on the proposed use of and associated noise produced by the equipment or process.

To request a noise survey, contact the hearing conservation program manager.
Design Review
When new projects at SLAC are reviewed, the design review coordinator forwards packages involving machinery and other high noise-producing equipment to the hearing conservation program manager for evaluation. The program manager identifies any areas of concern, provides comments and recommendations for safe use, and may require noise level monitoring before equipment is used by personnel.

DOE-required Monitoring
The standards for occupational noise exposure adopted by the DOE state that personnel without hearing protection must not be exposed to an intensity of noise exceeding 85 dBA based on an eight-hour time-weighted average (TWA) as measured on the A-weighted scale. Noise level monitoring is necessary to identify designated noise areas and to determine which personnel are affected by the hearing conservation program (see Hearing Conservation: Hazard Recognition Requirements).
Hearing Conservation: Sample Designated Noise Area Warning Sign

Department: Chemical and General Safety
Program: Hearing Conservation
Owner: Program Manager, John Shepardson
Authority: ES&H Manual, Chapter 18, Hearing Conservation

Effective hazard warning signs must be posted at all entrances to designated noise areas. There are no specific requirements for the wording on the sign; however, it must clearly state the noise hazard and requirements of the area. The following is a sample.

CAUTION

DESIGNATED NOISE AREA HEARING PROTECTION REQUIRED WHEN EQUIPMENT IS OPERATING
Hearing Conservation: Designated Noise Area List

Department: Chemical and General Safety
Program: Hearing Conservation
Owner: Program Manager, John Shepardson
Authority: ES&H Manual, Chapter 18, Hearing Conservation

The following areas have been identified by the hearing conservation program as designated noise areas:

1. Building 023 – Boiler Room
2. Building 035 – CEF Carpentry Shop
4. Building 127 – Helium Compressor Building
5. Building 1703 – PEP Pump Pit
6. Building 1801 – Pump Pad

Special requirements apply to these areas. See Chapter 18, “Hearing Conservation”, for more information.¹