CHAPTER 41 - OCCUPATIONAL NOISE

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A. INTRODUCTION

1. The Smithsonian Institution (SI) is committed to preventing occupational noise-induced hearing loss through a comprehensive program of engineering controls, administrative controls, and hearing protection, in accordance with the Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) Standard 1910.95, "Occupational Noise Exposure."
2. This Chapter applies as a minimum to all SI tasks and operations that may potentially exposure workers to noise in excess of 85 dBA; however it is the goal of the SI to reduce noise exposure to as low as reasonably achievable below 85dBA.

B. CHAPTER-SPECIFIC ROLES AND RESPONSIBILITIES

1. Safety Coordinators shall:
   a. Request assistance from the Office of Safety, Health and Environmental Management (OSHEM) with personal and/or area noise monitoring. Utilize Medical Surveillance Request Form (Attachment 5) forwarded from supervisor and sent to OSHEM (IH) (via email when possible).
   b. Coordinate initial and annual audiometric evaluations for affected employees.
   c. Assist supervisors with the implementation of engineering and/or administrative controls as required by the results of noise monitoring.
   d. Work with employees and supervisors to schedule audiometric tests utilizing a schedule of dates and times provided by OSHEM. When the listing is finalized, send the list of confirmed appointments to OSHEM.
   e. Ensure that employees keep their appointments for scheduled hearing exams.
   f. Refer all new or transferring employees, who require enrollment in the SI Hearing Conservation Program, to OSHEM within 30 days of assignment.
2. Supervisors shall:
   a. Identify noise hazard areas in their work operations and arrange for exposure monitoring by OSHEM through their Safety Coordinators.

Utilize Medical Surveillance Request Form (Attachment 5) and send to Safety Coordinator (via e-mail when possible).

b. Ensure that recommended engineering and/or administrative controls are implemented to reduce exposures to below the OSHA Permissible Exposure Limit (PEL) of 90 dBA TWA (8-hour time-weighted average).

c. Enroll all employees exposed to noise at or in excess of the OSHA Action Level of 85 dBA TWA in the SI Hearing Conservation Program through the Safety Coordinator to the Office of Safety, Health, and Environmental Management (OSHEM). Ensure that enrolled employees receive initial and annual training, and an initial and annual audiogram.

d. Ensure that employees are scheduled the appropriate time to keep their appointments for initial and annual audiograms, including any audiometric consults.

e. Ensure that employees keep their appointments for scheduled hearing exams.

f. Provide appropriate hearing protection to all employees exposed to noise exceeding 85 dBA (regardless of TWA), enforce mandatory wear when noise exceeds 90 dBA, ensure that the devices are worn correctly, and ensure that sufficient quantities of replacement protective devices are available.

3. Employees shall:

   a. Use hearing protection as required.

   b. Inspect and maintain hearing protection devices. Replace hearing protection devices when necessary.

   c. Participate in initial and annual audiograms.

   d. Participate in initial and annual hearing conservation training.

   e. Notify their supervisor if they believe they are being exposed to noise extremes through regular work practices, or when a change in work practices increases exposure to noise extremes.

4. Office of Safety, Health and Environmental Management (OSHEM) shall:

   a. Conduct personal and/or area noise monitoring at the request of the facility, provide supervisor and employees with the results of personal monitoring, and recommend engineering and/or administrative controls as necessary based on the monitoring results.

b. Notify supervisors through Safety Coordinators to enroll all employees exposed at or above the OSHA Action Level of 85 dBA TWA in the SI Hearing Conservation Program.

c. Conduct audiometric testing of all employees referred to the Hearing Conservation Program from appointments scheduled by the Safety Coordinator, list of dates and times provided by OSHEM.

d. Conduct initial and annual training for employees included in the Hearing Conservation Program.

e. Ensure proper instruction in the initial use and fit of all hearing protection devices.

f. Maintain exposure measurement and audiometric test records.

C. HAZARD IDENTIFICATION

1. Initial Assessment

   a. Each job task or work area within a facility shall be assessed by the supervisor (with assistance from the Safety Coordinator) to identify noise sources (e.g., locations, equipment, processes, etc.) that have the potential for employee exposure at or above 85 dBA (see Attachment 1 of this Chapter). This determination may be made using:

      (1) The Job Hazard Analysis (JHA) process (refer to Chapter 4, "Safety Risk Management Program", of this *Manual*).

      (2) Self assessments/inspections.

      (3) Employee complaints about excessive noise.

      (4) Observation of the difficulty in understanding normal conversation 2-3 feet away from the speaker.

      (5) Quantitative noise measurements at the noise source.

      (6) Employee noise exposure monitoring results.

   b. The supervisor shall arrange, through the Safety Coordinator, for employee noise exposure monitoring (if none has been conducted in the past) or updated monitoring if work conditions have changed since the last monitoring survey.

2. Follow-up Assessments. The supervisor, through the Safety Coordinator, shall ensure the noise hazard is reassessed whenever a change in production, process, equipment, or controls occurs that may alter the initial assessment or employee noise exposure monitoring results.

3. Employee Exposure Monitoring

a. When assessment indicates that any employee's noise exposure may equal or exceed 85 dBA, employee exposure and/or area noise monitoring shall be conducted to characterize the exposure and determine if the OSHA Action Level of 85 dBA TWA has been reached or exceeded. The Safety Coordinator is to contact OSHEM to arrange for monitoring.

b. OSHEM shall provide a report to the Safety Coordinator with a copy to the supervisor detailing the results of area noise monitoring, employee noise exposure monitoring, and recommendations for engineering/administrative controls. The report shall specifically advise which employees are exposed to noise levels sufficient for entry into the Hearing Conservation Program (refer to Section D below), and which job tasks and equipment produced this exposure level.

c. The supervisor shall provide a copy of the noise exposure monitoring report to every employee to whom it applies, within 15 days of receipt of report.

d. The supervisor shall implement the OSHEM recommendations immediately providing hearing protection personal protective equipment (PPE) as an interim control and, in conjunction with the Safety Coordinator, institute permanent controls within 30 days.

D. HAZARD CONTROL, for work operations producing noise exposures at or above 85 dBA.

1. Engineering and/or administrative controls (see Attachments 2 and 3 for a discussion of these types of controls) must be implemented to eliminate the noise hazard or mitigate the hazard to at least below the Action Level of 85 dBA, TWA. The OSHEM noise exposure monitoring report is to be consulted for specific recommendations.

2. Hearing Protection Devices (HPDs)

   a. HPDs shall be made available to all employees exposed to 85 dBA or greater (regardless of TWA), and required to be worn when:

      (1) The noise exposure is 90 dBA TWA or greater.

      (2) The noise exposure is 85 dBA TWA or greater and the employee has experienced a significant threshold shift per audiometric testing.

      (3) The noise exposure is 85 dBA TWA or greater and the employee has not yet had a baseline audiogram.

   b. HPDs shall be provided at no cost to employees. OSHEM provides the initial HPDs during baseline testing. The unit needs to provide

additional plugs and muffs, based on the OSHA Noise Reduction Rating (NRR) and employee's input.

c. HPDs are only an interim control until hazard mitigation is achieved. HPDs are not to be used as a permanent control solution unless engineering or administrative controls are determined to be infeasible.

d. Employees shall be given the opportunity to select their hearing protection from a variety of suitable HPDs. Selection of the appropriate HPD depends on many factors, such as noise attenuation required, audibility of communication and warning signals, compatibility with other safety equipment, and comfort. It is important to note that not every type of hearing protection is useful for every type of noise. More information on selection is found in Attachment 4 of this Chapter.

3. Medical Surveillance. All employees exposed to noise levels of 85 dBA TWA or greater will be enrolled, by the supervisor through the Safety Coordinator, into the SI Hearing Conservation Program, administered by OSHEM. (See section E of this Chapter).

4. Caution Signs must be posted at entrances to work areas or near equipment where hearing protection is required or made available, identifying the noise hazard and warning that hearing protection must be worn while the equipment is in operation.

E. HEARING CONSERVATION PROGRAM.

OSHEM Occupational Health Services Division will administer the SI Hearing Conservation Program (HCP) to include the following provisions:

1. A baseline audiogram shall be provided to the employee within 30 days of an employee's first noise exposure at or above the Action Level of 85 dBA as an eight-hour TWA. This audiogram shall establish a baseline against which subsequent audiograms may be compared. The examination shall be provided at no cost to the employee.

2. Audiometric tests shall be performed by a technician currently certified by the Council for Accreditation in Occupational Hearing Conservation, who meets the requirements outlined in OSHA 29 CFR 1910.95(g) (3).

3. An annual audiogram shall be obtained thereafter for each employee exposed at or above the Action Level of 85 dBA TWA.

4. If the annual audiogram shows that an employee has suffered a significant threshold shift (STS), the supervisor and employee shall be notified in writing within 21 days and the employee re-tested within 30 days. The employee must use HPDs in the interim prior to the re-test. An audiologist, otolaryngologist, or occupational physician shall review the confirmed STS re-test audiogram, and shall determine if there is a

need for further evaluation. Occupational Health Services shall notify the employee within 21 days of an STS determination of the results and recommendations. If the retest done within the 30 day period does not show an STS, the new test may be considered the regular annual test and mandatory use of the PPE from perceived STS is discontinued. If the retest confirms the STS, the mandated use of HPDs is continued indefinitely.

5. OSHEM will fit employees initially with suitable hearing protection devices and provide hearing conservation training to employees in the HCP.

F. TRAINING

1. Supervisors shall ensure each employee enrolled in the Hearing Conservation Program receives training (initial and annual refresher) in accordance with the OSHA Hearing Conservation Amendment, including the following topics:
   a. The effect of noise on hearing.
   b. The purpose of HPDs.
   c. The advantages and disadvantages of various types of HPDs.
   d. The noise attenuation of various types of HPDs.
   e. The selection, fitting, use, and care of HPDs.
   f. The purpose of audiometric testing.
   g. An explanation of the audiometric testing procedure.
2. Supervisors will periodically reinforce the training provided to ensure that employees are wearing, storing and cleaning the assigned hearing protection properly, abiding by all caution signs and utilizing established noise reduction controls and work practices.

G. REQUIRED INSPECTIONS AND SELF ASSESSMENTS

1. Safety Coordinators and supervisors shall review their operations at least annually or when a change in process, employees or materials occur to ensure that employees are properly assessed for exposures per this Chapter, and enrolled in appropriate medical surveillance programs, per this Chapter.
2. OSHEM shall evaluate the Hearing Conservation Program annually and revise the program as needed.

H. RECORDS AND REPORTS

1. Audiometric Examinations
    a. OSHEM shall retain all employee audiometric test records. This record shall include the following information:
        (1) Name and job classification of the employee;
        (2) Date of the audiogram;
        (3) The examiner's name;
        (4) Date of the last acoustic or exhaustive calibration of the audiometer; and
        (5) Employee's most recent noise exposure assessment.
    b. Audiometric test records shall be retained for the duration of the affected employee's employment.
    c. The employer shall maintain accurate records of the measurements of the background sound pressure levels in audiometric test rooms.
2. Noise Exposure Measurements. The supervisor shall maintain an accurate record of all employee noise exposure measurements. Noise exposure measurement records shall be retained for at least two years.
3. Training Records. A written training certification record shall be documented in the OSHEM Employee’s Electronic Medical Record.

I. REFERENCES

1. National Safety Council, written by Stacie Zoe Berg, “Safe Worker: Sound Advice—Protect Your Ears in Noisy Work Environments.” February 2000. http://www.nsc.org/pubs/sw.htm
2. University of Chicago, Occupational Safety and Health Programs, “Safety*Manual*: Section 3.11 – Hearing Conservation Program.” Revised 04/07/2006. http://safety.uchicago.edu/3_11.html
3. OSHA 29 CFR 1910.95, “Occupational Noise Exposure.”
4. URS Safety Management Standards, “SMS 26: Noise and Hearing Conservation.” Revised July 10, 2000
5. Indiana University of Pennsylvania (IUP), “Safe 664: Industrial Noise Control.” Copyright 2002, Robert D. Soule
6. Centers for Disease Control (CDC), National Institute for Occupational Safety and Health (NIOSH), “NIOSH Safety and Health Topic: Noise and Hearing Loss Prevention – Workplace Solutions.” http://www.cdc.gov/niosh/topics/noise/workplacesolutions/hearingchecklist.html
7. National Safety Council, “Today’s Supervisor: Noise Control – An Affordable Solution.” February 1, 2000. http://www.nsc.org/pubs/ts/noise.htm
8. OSHA Standards http://www.osha.gov/SLTC/noisehearingconservation/standards.html
9. OSHA 29 CFR 1910.95 http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9735
10. Safety+Health, July 2007 pp 40-43. “Keep the Noise Down”.

Attachment 1

Initial Hazard Assessment

When employees are subjected to sound exceeding those levels listed in the following table, feasible engineering and administrative controls shall be used as the first step in noise control. If these controls fail to reduce sound to acceptable levels, hearing protection devices shall be used. Personal protective equipment (PPE) should be a last resort control measure. During the implementation of administrative and/or engineering controls, affected employees shall be provided with hearing protection devices and trained in accordance with this Chapter.

OSHA Table G-16, 29CFR1910.95 Acceptable Employee Noise Exposure Levels	
Duration of Noise Exposure (Hours)	Sound Pressure Level dBA [*1] (Slow Response)
8	90
6	92
4	95
2	100
1	105
1/2	110
1/4 or less	115
[*1] Note: Exposures to impulse/impact noise shall not exceed 140 dB peak sound pressure level.	

Attachment 2

Discussion of Engineering Controls

Engineering controls shall be used when any modification or replacement of equipment, or related physical change at the noise source or along the transmission path, may be altered to reduce the noise level at the employee's ear. Typical engineering controls include the following:

- Process substitution – modification of the methods and/or techniques for doing a particular job or task (e.g., replace a riveting process with a bolting process).
- Equipment substitution – the job/task is performed the same way, but the specific equipment is replaced or changed in some way that results in less noisy equipment. Engineering controls #3 and #6 are examples of equipment substitution.
- Substitution of materials of construction – the same job is performed with the same equipment, but some material in the equipment is changed, which results in less noisy equipment. For example, exchange a heavy/solid material (often metal) with a highly damped material (e.g., rubber, leather, felt, specialty plastics).
- Reducing noise at the source – enclose noise source with an isolating structure (e.g., a total enclosure, a partial barrier). Other examples of source reduction: add or replace mufflers on motorized equipment and pneumatic equipment, reduce air pressure as much as possible; consider using Lexan instead of open guarding.
- Interrupting the noise path – use sound absorbing materials on walls, floors, and/or ceilings.
- Reducing vibration – reduce/minimize the force being applied to the equipment and ultimately to the surface in vibration. For example, follow equipment maintenance procedures for proper lubrication of bearings to keep equipment running smoothly.
- Employee/equipment isolation – use enclosures or barriers that reduce the amount of noise that makes it to employees (e.g., operator control room, enclosed equipment cab).

Attachment 3

Discussion of Administrative Controls

Administrative controls are secondary to engineering controls, but can also be beneficial. Administrative controls basically involve a change in work schedules or operations to reduce noise exposures. Examples of administrative controls include:

- Operating a noisy machine on the second or third shift when fewer employees will be exposed to the noise.
- Locating a noisy machine in an area where the minimum number of employees will be affected by the noise.
- Shifting an employee to a less noisy job once a hazardous daily noise dose has been reached. Rotating employees on noisy jobs requires knowledge of the noise dose-time relationship.

Attachment 4

Selection of Hearing Protection Devices (HPD)

This information is summarized from "Noise and Hearing Loss Prevention – Choose The Hearing Protection That's Right For You" , by the Centers for Disease Control (CDC), National Institute for Occupational Safety and Health (NIOSH) www.cdc.gov/niosh/topics/noise/abouthlp/chooseprotection.html

Advantages and Disadvantages of Each Type of HPD		
Type of HPD	Advantages	Disadvantages
Expandable (formable) ear plugs	Generally less sensitive to an individual's fit since they can expand/conform to match the anatomy of the ear canal. Relatively inexpensive. Some come in multiple sizes to accommodate different size ear canals. Among the most comfortable and accepted by workers.	Do not provide adequate noise attenuation if not sealed well or sized to ensure proper fit. In a dirty environment, plugs will get dirty because they must be rolled to fit.
Pre-molded, reusable ear plugs	Relatively inexpensive. Reusable; washable. In a dirty environment, plugs do not need to be rolled. Some come in multiple sizes to accommodate different size ear canals.	May need a different size plug for each ear. Do not provide adequate noise attenuation if not sealed well or sized to ensure proper fit. Not as comfortable as expandable ear plugs.
Canal caps	Convenient – when it is quiet the band can be left hanging around an employee's neck.	Some people find the pressure from the bands uncomfortable. Not all canal caps have tips that adequately block all types of noise.

Ear muffs	Come in many models designed to fit most people. Last longer than ear plugs. Easy for supervisor to determine (visually) if workers are complying with mandatory hearing protection requirements.	Must get a good seal against the side of the head rather than in the ear canal. More expensive than ear plugs. Workers tend to find them less comfortable to wear over long periods of time. Workers with glasses, heavy beards, sideburns may not get a good fit.

Noise Reduction Rating

The Environmental Protection Agency (EPA) requires that HPDs be labeled with their Noise Reduction Rating (NRR). The NRR is a number rating of noise attenuation as measured under controlled laboratory conditions. Due to reports of inconsistent reliability of these ratings when applied to individual workers, OSHA requires an adjustment of the ratings.

The OSHA "Effective NRR" is equal to half of the laboratory (manufacturer's listed) NRR.

The HPD selected for use shall have an OSHA Effective NRR sufficient to reduce the employee's noise exposure at/below the Action Level of 85 dBA TWA.

Example using OSHA Effective NRR calculation: Employee noise exposure monitoring results show an employee is exposed to 100 dBA of noise. In order to reduce the employee's exposure at/below 85 dBA (15 dB difference), the HPD selected must have an EPA listed NRR of 30 dB or greater to achieve the OSHA Effective NRR of 15 dBA.

Attachment 5

OSHEM Medical Surveillance Program Request Form

STEP 1 – Authorization Request:

Employee Name: _____
Last 4 digits SS#:_____ Occupation:_____
Phone #:_____ DOB: _____ E-mail: _____
Location: _____ FAX #: _____
Supervisor: _____ Phone#:_____
E-mail: _____ Initial Request: _____ / Up-dated requested for:
_____

STEP 2 - Safety Coordinator's Instructions:

This form must be completed by the supervisor, validated by the Safety Coordinator and exposures confirmed by the OSHEM Industrial Hygienist. OSHEM Industrial Hygienist will forward the request to OHSD.

STEP 3 - Reason for Request (Check all that applies):

Arsenic ☐	BBP ☐	Cadmium ☐	Chromium ☐
Cyanide ☐	Formaldehyde ☐	Lead ☐	Mercury ☐
Methylene Chloride ☐	Organophosphates ☐	Carbamates ☐	Hazardous Noise ☐
Other ☐			

STEP 4 - Explain Job Tasks Requiring Monitoring/Immunization(s):

Work Area: _____
Explanation: _____
_____
_____
_____

_____ _____
Supervisor's Signature Date

_____ _____
Safety Coordinator's Signature Date

_____ _____
Industrial Hygienist Signature Date

(Route through email)

Version 1.0 Effective October 2007