

FESHM 4140: HEARING CONSERVATION

Revision History

Author	Description of Change	Revision Date
Jonny Staffa	Made minor edits due to centralization of ESH&Q. There were no changes to chapter content.	August 2017
David Baird	Formatted the chapter according to new FESHM requirements and made minor edits	May 2012

TABLE OF CONTENTS

1.0	INTRODUCTION	3
2.0	DEFINITIONS	3
3.0	RESPONSIBILITIES	3
3.1	Division/Section (D/S) Heads or Project Managers	3
3.2	Managers and Supervisors	4
3.3	Task Manager/Service Coordinator	4
3.4	Division Safety Officer (DSO)	4
3.5	Industrial Hygiene Group	4
3.6	Fermilab Medical Department	4
3.7	Employees	4
4.0	PROGRAM DESCRIPTION	4
4.1	Hearing Conservation Program	4
4.2	Monitoring	5
4.2.1	Area Samples	5
4.2.2	Personal Samples	5
4.2.3	Employee Notification	5
4.3	Posting of High Noise Areas	5
4.4	Audiometric Testing Program	5
4.5	Noise Control	7
4.6	Hearing Protection	7
4.7	Training	7
4.8	Record Retention	8
5.0	REFERENCES	8

1.0 INTRODUCTION

Fermilab has a variety of high noise sources, categorized as continuous and/or impact, such as compressors, pumps, and machine tools. Exposure can be above an 8-hour time weighted average of 85 decibels using the A-weighted scale (dBA). A hearing conservation program is in place to prevent occupationally related noise induced hearing loss from such exposures and comply with American Conference of Government Industrial Hygienists (ACGIH[®]), “Threshold Limit Values (TLVs[®]) for Chemical Substances and Physical Agents and Biological Exposure Indices.

2.0 DEFINITIONS

Administrative control - those means of minimizing employee noise dose by controlling the duration of exposure.

Audiometric technician - an individual who has satisfactorily demonstrated competence in performing audiometric examinations, obtaining valid audiograms and properly using, maintaining, and calibrating audiometers, under the supervision of a physician.

Engineering controls - those means of minimizing employee noise dose with engineering methods such as enclosure of the noise source, redesign of noise producing equipment, application of noise dampening technology, etc.

Noise dosimeter - an instrument that integrates sound levels over a period of time to determine a noise dose. The noise dosimeters must meet the American National Standards Institute (ANSI): Specification for Personal Noise Dosimeters. ANSI S1.25-1991, ANSI, New York (1991).

Threshold Limit Value (TLV[®]) - Noise exposure that shall not exceed those levels listed in the ACGIH[®], Noise Standard (Table 1, TLVs[®] for Noise). The TLV[®] is exceeded when the dose is more than 100% as indicated on a dosimeter set with a 3 dB exchange rate and an 8-hour criteria level of 85 dBA. Also, no exposure to continuous, intermittent, or impact noise in excess of a peak C-weighted level of 140 dB.

Representative sampling - measurements of an employee's average sound level that is representative of exposures of other employees performing that job on the same shift.

Standard threshold shift - an average change in hearing threshold of 10 dB or more, relative to the baseline audiogram, at 2000, 3000, and 4000 Hz in either ear, adjusted for age using the methods specified in OSHA Regulation on Hearing Loss Recordkeeping, 29 CFR 1904.10.

3.0 RESPONSIBILITIES

3.1 Division/Section (D/S) Heads or Project Managers

Division/Section Heads and Project Managers will ensure the requirements of this chapter are fulfilled regarding noise hazards, including notification, sampling, mitigation and training.

3.2 Managers and Supervisors

Notify DSO of any changes in personnel enrolled in the program through the Individual Training Needs Assessment (ITNA) process and any changes in working conditions that may change workers' exposure to noise, and to assure that Hearing Protection Devices are used properly.

3.3 Task Manager/Service Coordinator

- Ensure that the projects involving potential noise exposure are addressed in specifications provided to contractors.
- Ensure that noise exposures are handled using control measures to prevent exposures exceeding regulatory standards. These measures must be reflected in the written Hazard Analysis ([FESHM 2060](#)).

3.4 Division Safety Officer (DSO)

- Provide guidance and technical information on the Fermilab Hearing Conservation Program (HCP).
- Assist Industrial Hygienist with his/her duties upon request.

3.5 Industrial Hygiene Group

- Maintain noise level readings for the Lab via industrial hygiene sampling database.
- Develop and maintain the HCP training (FN000154/CR).
- Provide and maintain noise monitoring equipment.
- Conduct noise monitoring to identify high noise areas and employees to include in the HCP.
- Input monitoring results into the industrial hygiene sampling database.
- Notify each employee of their measured exposure or their representative exposure that is attributed to the employee.
- Identify and post areas where the ambient noise level is equal to or exceeds the limit values in Table 1, to provide employee training, to evaluate hearing protection, and to recommend engineering and/or administrative controls.

3.6 Fermilab Medical Department

- Administer the audiometric testing program and retain audiometric test records.
- Notify the appropriate DSO and the Industrial Hygiene Group when a standard threshold shift in an employee's hearing level has been detected.

3.7 Employees

- Notify their DSO of unidentified and potentially hazardous noise exposure situations.
- Wear hearing protection when required.

4.0 PROGRAM DESCRIPTION

4.1 Hearing Conservation Program

A continuing, effective hearing conservation program shall be administered whenever representative employee noise exposure equals, exceeds, or has the potential to exceed the limit values in Table 1.

4.2 Monitoring

4.2.1 Area Samples

Area sampling may be used to identify areas or equipment that exceeds the limit values in Table 1. Whenever possible, an octave band analysis should be done.

Area sampling should be repeated whenever there is a change in the area or equipment which could significantly change the noise exposure level.

4.2.2 Personal Samples

When, in the judgment of the DSO, Supervisor, or Industrial Hygiene Group, an employee's noise exposure may equal or exceed 85 dBA, representative sampling shall be performed by the Industrial Hygiene Group. The employee(s) selected for monitoring shall be representative of the exposure of all employees performing the same task. The initial exposure determination shall be done based on "worst case" scenarios. The rationale for the sampling strategy shall be documented on the Noise Sampling Field Notes Form.

Personal noise monitoring shall be repeated whenever a change in production, process, equipment or controls increases noise exposures. Monitoring frequency shall be based on the judgment of the Industrial Hygiene Group.

4.2.3 Employee Notification

The Industrial Hygiene Group shall promptly notify each employee, in writing, of their measured exposure or the representative exposure that is attributed to the employee via the Industrial Hygiene Sampling Database. The medical department has been given access to the Industrial Hygiene Sampling Database for future reference.

Affected employees or their representative shall be provided an opportunity to observe any measurements of noise exposure.

4.3 Posting of High Noise Areas

Each D/S should post those areas where the sound pressure level is equal to or exceeds 85 dBA. The sign shall say, "HIGH NOISE AREA HEARING PROTECTION REQUIRED".

4.4 Audiometric Testing Program

- a. An audiometric testing program shall be administered and maintained for all employees who are enrolled in the hearing conservation program.
- b. The test shall be performed by certified audiometric technicians under the supervision of the Occupational Medicine Office.
- c. Baseline Audiograms

A baseline audiogram shall be obtained when the employee is added to the Hearing Conservation Program.

Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace noise. The use of hearing protectors during the 14 hour period meets this requirement.

An annual audiogram may be substituted for a baseline audiogram if in the opinion of the supervising physician, the standard threshold shift shown by the audiogram is persistent or the hearing threshold shown in the annual audiogram indicates significant improvement over the baseline audiogram.

d. Annual Audiograms

At least annually, a new audiogram shall be obtained for each employee in the Hearing Conservation Program.

e. Evaluation of Audiograms

Each employee's annual audiogram shall be compared to the baseline audiogram to determine if a standard threshold shift (STS) has occurred. Age adjustment of the audiogram will be done if indicated. Evaluation may be performed by the certified technician.

If the annual audiogram shows a STS, the audiogram will be repeated within 30 days during which time the employee will be required to use hearing protection in areas that equal or exceed 85 dBA.

The physician reviews the follow-up audiogram to determine if there is further need for evaluation.

If the repeat test confirms STS, the employee will be promptly advised (must take place within 21 days). If the physician has determined a work relationship, the following action shall be taken:

The employee shall be re-trained on the use of available hearing protection. Different styles of hearing protection will be provided if necessary.

The employee will be referred for a clinical audiological or otological evaluation if additional testing is necessary or the physician suspects a medical pathology of the ear.

Standard threshold shift (STS), an average change in hearing threshold of 10 dB or more, relative to the baseline audiogram, at 2000, 3000, and 4000 Hz in either ear, adjusted for age using the methods specified by OSHA, will be reported to Department of Energy (DOE) via the Computerized Accident Injury Reporting System (CAIRS) report form by the DSO or designee. If the STS is confirmed

and the employee's overall hearing level is 25 dB or more averaged at 2000, 3000, and 4000Hz above audiometric zero in either ear and the hearing loss is determined to be work-related then the case will be recorded on the OSHA 300 log.

- f. **Audiometer Calibration**
Audiometric tests shall be conducted with audiometers that meet the specifications of, and are maintained and used in accordance with ANSI Specification for Audiometers, S3.6-2004.

4.5 Noise Control

The use of engineering or administrative controls shall be investigated, documented and implemented where feasible to reduce employee exposure levels to below the limit values in Table 1.

Changes in production, processes, or equipment shall be reviewed in advance to determine if these changes will expose employees at or above the ACGIH[®] Threshold Limit Value (TLV[®]). Engineering controls shall be considered if noise levels associated with the changes will equal or exceed the limit values in Table 1.

The design of new facilities or operations shall be reviewed to determine the potential for noise exposure. Engineering controls shall be considered to keep noise levels associated with the new operation at or below the limit values in Table 1.

4.6 Hearing Protection

Hearing protection shall be required for all employees who work in areas where exposure may equal or exceed the limit values in Table 1.

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

Employees must be trained in the proper use and care of hearing protection issued to them.

Hearing protection must be evaluated by the ESH&Q Section to ensure that they attenuate noise levels to less than 85 dBA.

Supervision shall assure that hearing protection is worn properly.

4.7 Training

An individual must be enrolled in the Hearing Conservation Program and complete Hearing Conservation Training (FN000154/CR) upon assignment to a job that has been identified as having an exposure level at or above 85 dBA. Training must be completed annually thereafter if the person remains in the Hearing Conservation Program.

The training addresses the following:

- effects of noise on hearing
- basic elements of the noise reduction and hearing conservation program
- specific nature of operations that could result in over exposure to noise
- use of engineering controls to reduce noise exposure
- fitting, use, and maintenance of personal protective equipment associated with the employee's job assignment
- location of high noise areas, operations with potential of producing high noise levels, and special precautions to be taken in these areas
- purpose and description of the audiometric testing program

4.8 Record Retention

Noise measurements shall be entered by the ESH&Q Section into the IH Sampling database. Audiogram results are maintained by the Medical Department and entered into the Audiometric Testing Database.

5.0 REFERENCES

"Specification for Personal Noise Dosimeters," ANSI S1.25 – 1991 (R2007).

"Specification for Sound Level Meters," ANSI S1.4-1983 (R2006).

"Specifications for Audiometers," ANSI S3.6-2004.

ACGIH[®] Noise Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, 2017.

TABLE 1

The ACGIH®-TLV® for "continuous" noise is given in the table below. The "A" in "dBA" means that the sound pressure levels have been frequency weighted in a way which mimics the spectral effectiveness of noise to induce hearing loss.

TLVs® for Noise^A

Duration per Day		Sound Level dBA ^B
Hours	24	80
	16	82
	8	85
	4	88
	2	91
	1	94
	Minutes	30
15		100
7.50 ^C		103
3.75 ^C		106
1.88 ^C		109
0.94 ^C		112
Seconds ^C		28.12
	14.06	118
	7.03	121
	3.52	124
	1.76	127
	0.88	130
	0.44	133
	0.22	136
	0.11	139

^A No exposure to continuous, intermittent, or impact noise is permitted in excess of a peak C-weighted level of 140 decibels (dB).

^B Sound level in dB is measured on a sound level meter, conforming as a minimum to the requirements of the American National Standards Institute Specification for Sound Level Meters, - Part 1: Specifications, S1.4 (ANSI 2007) Type 2, and set to use the A-weighted network with slow meter response.

^C Limited by engineering control of the noise source if feasible. Administrative control is permissible if engineering control is infeasible.