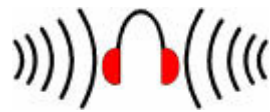


Dickinson College



Hearing Conservation Program

April 17, 2006

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I. Introduction to Hearing Conservation

A. Purpose

This document serves as the written guide for Dickinson College compliance to 29 CFR 1910.95, titled, "Occupational Noise Exposure" and the Hearing Conservation Program (HCP) requirements contained therein. All employees at Dickinson College whose job duties expose them to noise levels exceeding the permissible exposure limits set by OSHA in 29 CFR 1910.95, are required to comply with this document.

This document will hereafter be known as the Dickinson College Hearing Conservation Plan.

B. Scope

The Dickinson College Hearing Conservation Program shall apply to all employees of Dickinson College with noise exposures equal to or exceeding an 8-hour time-weighted average (TWA) of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of fifty percent (the action level). For purposes of the hearing conservation program, employee noise exposures shall be computed in accordance with Appendix A and Table G-16a of the Occupational Noise Exposure standard (29 CFR 1910.95). Employee noise exposure shall be computed without regard to any attenuation provided by the use of personal protective equipment.

II. Responsibility

In compliance with 29 CFR 1910.95, titled "Occupational Noise Exposure", Dickinson College realizes our responsibility for the protection of our employees. We hereby institute the enclosed hearing conservation program to assist us in our safety program.

Dickinson College hereby appoints William J. Shoemaker to be our hearing conservation program administrator. We acknowledge the hearing conservation program administrator has the knowledge and authority to implement and enforce our hearing conservation program.

Although we, Dickinson College, are designating Mr. Shoemaker as our hearing conservation program administrator, we realize the success of our hearing conservation program rests with all of our employees. The ultimate responsibility for the hearing conservation program rests with the President of Dickinson College.

- A. The **President of Dickinson College** has ultimate responsibility for hearing conservation within the institution. General oversight responsibility is assigned to the **Vice President for Campus Operations**.
- B. The **Director of Environmental Health & Safety** will be responsible for administering the Dickinson College Hearing Conservation Program. This includes
 1. working with administrators and other employees to develop and implement the appropriate hearing conservation policies and practices.
 2. evaluating work areas based on noise exposure.
 3. educating supervisors and employees about the effects of noise exposure.
 4. advising on administrative and engineering controls that reduce noise exposure.
 5. recommending proper personal protective equipment
 6. scheduling initial and annual hearing test services
 7. scheduling annual training for exposed employees and their supervisors.
 8. maintaining exposure measurements, audiometric test records, and training records.
- C. The **Supervisor** has a primary responsibility for implementing the Dickinson College Hearing Conservation Program in the workplace. This includes:

1. ensuring that workers know and follow the hearing conservation program.
2. implementing administrative and engineering controls where possible to reduce noise exposure
3. ensuring that the required level of hearing protection is available, in working order, and that specific training in its use has been provided
4. notifying the director of environmental health and safety of changes in the workplace that affect noise levels.
5. enforcing the use of proper hearing protection
6. ensuring that employees attend required annual hearing conservation program training.
7. ensuring that employees attend required baseline and annual hearing testing.
8. providing for the safety of visitors in the workplace

D. The **Employee** will be responsible for maintaining a thorough understanding of the Dickinson College Hearing Conservation Program and conducting each operation in accordance with the program. This includes:

1. following safe work practices to eliminate or reduce occupational noise exposure
2. attending required annual hearing conservation program training.
3. attending required baseline and annual hearing testing.
4. wearing the required level of hearing protection
5. reporting changes in the workplace that affect noise levels to their supervisor.

E. The **Safety Committee** assists the director of environmental health and safety and:

1. annually reviews the Hearing Conservation Program
2. conducts safety audits

III. Hazard Assessment

A. Hazard Recognition

When information indicates that any employee's noise exposure may equal or exceed an 8-hour time-weighted average of 85 dBA (the action level), Dickinson College must develop and implement a monitoring program. This information includes but is not limited to:

- job tasks that require the use of equipment known to generate high noise levels (e.g. – chainsaws, mowers, trimmers, saws, generators)
- work in close proximity to processes that generate high noise levels (e.g. – boiler room)
- noisy conditions which make normal conversation difficult
- employee complaints about the loudness of noise
- indications that employees are losing their hearing
- employees who notice that speech or sounds are muffled for several hours after noise exposure
- ringing in the ears
- actual workplace noise measurements

The monitoring program shall be designed to identify employees for inclusion in the hearing conservation program and to enable the proper selection of hearing protectors. Affected employees or their representatives shall be provided an opportunity to observe any noise measurements. Monitoring shall be repeated whenever a change in production, process, equipment or controls increase noise exposure to the extent that:

1. additional employees may be exposed at or above the action level, or
2. the attenuation provided by hearing protectors being used by employees may be rendered inadequate to meet the requirements of 29 CFR 1910.95,

or within 2 years of previous monitoring.

B. Noise Measurements

Noise monitoring equipment includes sound level meters, noise dosimeters, and the equipment used to calibrate those instruments. All sound levels from 80 dBA to 130 dBA shall be integrated into noise measurements. To select the appropriate type of noise monitoring equipment depends on whether the noise levels remain relatively constant and the mobility of the employees.

1. Sound Level Meters

A sound level meter is an instrument that measures the intensity of sound at a given moment. The microphone on the meter is placed near the employee's head. Since sound level meters provide a measure of sound intensity at only one point in time, it is generally necessary to take a number of measurements at different times during the day to estimate the noise exposure over a workday. If noise levels fluctuate, the amount of time noise remains at each of the various measured levels must be determined. To estimate employee noise exposure with a sound level meter it is also generally necessary to take several measurements at different locations within the workplace. After appropriate sound level meter readings are obtained, people sometimes draw "maps" of the sound levels within different areas of the workplace. By using a sound level "map" and information on employee location throughout the day, estimates of individual exposure levels can be developed. This measurement is generally referred to as "area" noise monitoring, and can be used to estimate noise exposure when noise levels are relatively constant and employees are not mobile.

2. Noise Dosimeters

A noise dosimeter is like a sound level meter except that it stores sound level measurements and integrates these measurements over time, providing an average noise exposure reading for a given period of time, such as an 8-hour workday. The microphone on the dosimeter is placed on the middle of the more exposed shoulder. At the end of the desired monitoring period, the exposure measurement is downloaded. Since, the dosimeter is worn by the employee, it measures noise levels in those locations in which the employee travels. Since, the dosimeter monitors sound levels continuously, noise level fluctuations need not be determined. This procedure, generally referred to as "personal" noise dosimetry, is best used to estimate noise exposure when noise levels vary and when employees are mobile.

Instruments used to measure employee noise exposure shall be calibrated to ensure measurement accuracy. To ensure accurate results, it is considered good professional practice to calibrate instruments before and after each use. Manufacturer's instructions, contained in sound level meter and dosimeter operating manuals, should be followed for calibration and maintenance.

C. Notification

Dickinson College shall notify each employee exposed at or above an 8-hour time-weighted average of 85 dBA of the results of monitoring.

IV. Noise Reduction

The Occupational Noise Exposure standard (29 CFR 1910.95) requires that employees be protected against the effects of noise exposure when the sound levels exceed those shown in Table 1, when measured on the A scale of a standard sound level meter at slow response.

TABLE 1

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

Supervisors must implement control measures to reduce employee exposure below these permissible noise levels. The three types of control measures are:

- A. **Administrative Controls:** methods of controlling employee exposures by job rotation, work assignment or time periods away from noise.
- B. **Engineering Controls:** methods of controlling employee exposures by modifying the source or path of the noise. Examples include installing quieter machinery, enclosing the machinery to isolate the noise, or adding barriers which absorb or reflect the noise away from the employee.
- C. **Personal Protective Equipment:** personal safety equipment designed for secondary employee protection from hazardous noise levels. Examples include ear plugs or muffs.

1. Requirements

- a. Personal protective equipment shall be made available to all employees exposed to an 8-hour time-weighted average of 85 dBA or greater at no cost to the employee. Hearing protectors shall be replaced as necessary.
- b. Engineering controls and administrative controls shall first be determined and implemented when feasible. When such

controls fail to reduce sound levels within the levels of Table 1, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table.

- c. Personal protective equipment shall be provided and used by any employee who is exposed to an 8-hour time-weighted average of 85 dBA or greater who:
 - i. has not yet had a baseline audiogram established within 6 months of their first exposure when a mobile test van is used for audiometric testing.
 - ii. has experienced a standard threshold shift.
- d. Employees shall be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors provided by the College.
- e. The College shall provide training in the use and care of all hearing protectors provided to employees.
- f. The College shall ensure proper initial fitting and supervise the correct use of all hearing protectors.

2. Selecting and Properly Fitting Hearing Protectors

The two most common types of hearing protection devices used at Dickinson College are earplugs and earmuffs. Although these hearing protectors do not eliminate all noise reaching the ear, they are generally capable of reducing the noise exposure below the 8-hour time weighted average of 90 dBA.

a. Earmuffs

Earmuffs provide an acoustic seal by completely surrounding the pinna, the flap of skin attached to the outside of the head, and sealing against the side of the head. Proper headband tension is important, as the earmuff needs to press against the side of the head to maintain an acoustic seal, whether it is hard hat mounted earmuffs or a banded earmuff.

The first step in fitting earmuffs is visual inspection: look carefully for gaps around the earmuff cushion. Earmuff fit can be tested in a “noise field.” For example, play a CD on computer speakers in the fitting area or take the earmuffs into the noise of the plant. Lift up the muff; put it back; and listen. A substantial difference should be evident between the muffs-on and muffs-off conditions. If the employee reports little difference, check the fit.

Earmuff cushions that seal against the head should be inspected regularly, and cracked or worn parts should be replaced. Other PPE can interfere with the acoustic seal. While most safety glass frames are small enough to not cause a problem, large frames may actually break the acoustic seal and significantly degrade the protection offered by earmuffs. Long hair should be pulled back to permit as much earmuff-to-skin contact as possible, but typically, facial hair is not a critical problem.

b. Earplugs

An earplug is inserted into the ear canal where it forms an acoustical seal. Assessing earplug fit can be more difficult, because what appears acceptable from the outside may not be a good fit. Most earplug manufacturers provide detailed guidelines and instructions for use of their specific products on their Web sites.

Earplugs are easier to fit using a technique called the “pinna pull.” Reaching over the head and gently pulling up and out on the pinna opens the entrance to the ear canal, making insertion of an earplug easier and more comfortable. Every ear is different, so the direction of the pull will vary—individual experimentation is appropriate.

Fitting and training are required even for foam earplugs. These devices are available in a range of sizes, and a visual inspection of the outer ear canal will lead to appropriate selection. To use foam earplugs:

- i. Roll the device lengthwise into a small, crease-free cylinder (the smaller the better)
- ii. Place it into the ear canal so that the outer surface of the plug is behind the tragus (the triangular shaped piece of skin just outside the entrance to the ear canal).

Some simple tests can help assess foam earplug fit.

- i. First, the “tug test” checks for acoustic seal. While the earplug is in place, grasp and gently pull out away from the head. Some resistance should be felt; if the plug pulls easily out of the ear, the insertion was not deep enough, or the plug was sized inappropriately.
- ii. The “cup test” is another simple fit check. With noise in the background and earplugs in place, cup hands firmly around the pinna, making a temporary earmuff. If the earplugs are properly seated, there should be little difference in the perceived noise hands-on as opposed to hands-off. If there is a significant difference in loudness or sound quality, the earplugs are not well fit.

Both tests can be used with preformed earplugs as well. Use the pinna pull with these devices, as opening and straightening the ear canal makes insertion much easier. Many of these devices come in a range of sizes. Initial size determination is easily done using visual inspection and the tug test. Improperly sized devices will either pull out too easily (if undersized) or will not penetrate the ear canal deeply enough (if oversized). The acoustic seal for flanged devices is obtained by the largest flange making firm contact at the entrance to the ear canal.

3. Effectiveness

a. Requirements

Hearing protection must attenuate employee exposure at least to an 8-hour time-weighted average of 90 dBA (85 dBA for employees who have experienced a standard threshold shift). It is good practice to attenuate employee exposure between 75 dBA and 80 dBA. This level facilitates communication and warning signal detection, while protecting the hearing of the worker.

b. Estimating the Adequacy of Hearing Protection Attenuation

Dickinson College shall evaluate hearing protection attenuation for the specific noise environments in which the protector will be used. The College shall use one of the evaluation methods

described in Appendix B of 29 CFR 1910.95, “Methods for Estimating the Adequacy of Hearing Protection Attenuation”

i. Noise Reduction Ratings and Derating

The Noise Reduction Rating (NRR), which must be shown on the hearing protector package, was developed by the Environmental Protection Agency to show the maximum noise reduction of a hearing protector. The NRR is based on idealistic laboratory conditions and reflects realistic values only to the extent that the protectors are properly fitted and worn. Based on actual real-world use, NIOSH has suggested different amounts of derating for three types of hearing protectors

a. Earmuffs

Subtract 25% from the manufacturer’s labeled NRR

b. Foam Earplugs

Subtract 50% from the manufacturer’s labeled NRR

c. All other earplugs

Subtract 70% from the manufacturer’s labeled NRR

ii. Calculating Estimated Exposure

When using a dosimeter that is capable of C-weighted measurements, the estimated exposure can be obtained by subtracting the derated noise reduction rating (NRR) from the C-weighted TWA.

$$[\text{Noise Level, dBC}] - [\text{derated NRR}] = \text{Est. Exposure dBA}$$

Since noise levels are typically reported on the A scale, when using a dosimeter that is not capable of C-weighted measurements, a correction factor of 7 dB must be subtracted from the derated NRR. This 7 dB correction is required because the A scale underestimates low-frequency noise and hearing protection devices generally provide less protection at lower frequencies. Thus, the estimated exposure can be obtained by subtracting 7 dB from the derated NRR, then subtracting the remainder from the A-weighted TWA.

$[\text{Noise Level, dBA}] - [\text{derated NRR} - 7] = \text{Est. Exposure dBA}$

The College generally does not use a sound level meter for calculating estimated exposure. Methods using a sound level meter are described in the Occupational Noise Exposure standard (29 CFR 1910.95 Appendix B).

c. Re-Evaluating

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

V. Audiometric (Hearing) Tests

A. General Requirements

1. Dickinson College shall establish and maintain an audiometric testing program by making audiometric testing available to all employees whose exposures equal or exceed an 8-hour time-weighted average of 85 dBA.
2. Dickinson College shall provide audiometric testing at no cost to its employees.
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 (CAOHC), 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.
4. All audiograms shall meet the requirements set forth in the Occupational Noise Exposure standard (29 CFR 1910.95 Appendix C, "Audiometric Measuring Instruments").

B. Audiograms

1. Baseline Testing

Within 6 months of an employee's first exposure at or above the action level (8-hour TWA equal or greater than 85 dBA or the equivalent), Dickinson College shall establish a valid baseline audiogram against which subsequent audiograms can be compared.

Where mobile test vans are used to meet the audiometric testing obligation, Dickinson College 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 wear hearing protectors for any period exceeding six months after the first exposure until the baseline audiogram is obtained.

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. Additionally, Dickinson College 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.

2. Annual Testing

At least annually after obtaining the baseline audiogram, Dickinson College shall obtain a new audiogram for each employee exposed at or above an 8-hour TWA of 85 dBA.

3. Evaluation of Audiogram

NOTE: As defined by OSHA in 29 CFR 1910.95, a *standard threshold shift* is a change in hearing threshold relative to the baseline audiogram of an average of 10 dBA or more at 2000, 3000, and 4000 Hz in either ear.

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 has occurred. This comparison may be done by a technician.

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 29 CFR 1910.95 Appendix F, "Calculation and Application of Age Correction to Audiograms."

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

The audiologist, otolaryngologist, or physician shall review problem audiograms and shall determine whether there is a need for further evaluation. Dickinson College shall provide this evaluator the following information:

- d. A copy of the requirements for hearing conservation (29 CFR 1910.95 paragraphs c through n)
- e. The baseline audiogram and most recent audiogram of the employee to be evaluated

- f. Measurements of background sound pressure levels in the audiometric test room as required in 29 CFR 1910.95 Appendix D: “Audiometric Test Rooms”.
- g. Records of audiometric calibrations required by 29 CFR 1910.95 paragraph (h)(5)

4. Post Evaluation Follow-Up Procedures

If a comparison of the annual audiogram to the baseline audiogram indicates a standard threshold shift, the employee shall be informed of this fact in writing, within 21 days of the determination.

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

- a. Employees not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them.
- 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.
- 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. Additionally, if a medical pathology of the ear, unrelated to the use of hearing protectors, is suspected the employee shall be informed of the need for an otological examination.

If subsequent audiometric testing of an employee whose exposure to noise is less than an 8-hour TWA of 90 dBA indicates that a standard threshold shift is not persistent, Dickinson College shall inform the employee of the new audiometric interpretations and may discontinue the required use of hearing protectors for that employee.

5. Revised Baseline

An annual audiogram may be substituted for the baseline audiogram when, in the judgement of the audiologist, otolaryngologist, or physician who is evaluating the audiogram:

- a. the standard threshold shift revealed by the audiogram is persistent; or
- b. the hearing threshold shown in the annual audiogram indicates significant improvement over the baseline audiogram

C. Audiometric Test Requirements and Audiometer Calibration

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.
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.
3. Pulsed-tone and self-recording audiometers, if used, shall meet the requirements specified in 29 CFR 1910.95 Appendix C: "Audiometric Measuring Instruments."
4. Audiometric examinations shall be administered in a room meeting the requirements listed in 29 CFR 1910.95 Appendix D: "Audiometric Test Rooms."
5. The functional operation of the audiometer shall be checked before each day's use by testing a person with known, stable 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 dBA or greater require an acoustic calibration.
6. Audiometer calibration shall be checked acoustically at least annually in accordance with 29 CFR 1910.95 Appendix E, "Acoustic Calibration of Audiometers." Test frequencies below 500 Hz and above 6000 Hz may be omitted from this check. Deviations of 15 dBA or greater require an exhaustive calibration.
7. 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.

VI. Training

A. Requirements

1. Dickinson College shall institute and ensure employee participation in a training program for all employees who are exposed to noise at or above an 8-hour TWA of 85 dBA.
2. The training program shall be repeated annually for each employee included in the hearing conservation program.
3. Information provided in the training program shall be updated to be consistent with changes in personal protective equipment and work processes.

B. Training Topics

Each employee shall be informed of the following:

1. The effects of noise on hearing
2. The purpose of hearing protectors
3. The advantages, disadvantages, and attenuation of various types of hearing protectors
4. Instructions on selection, fitting, use, and care of hearing protectors.
5. The purpose of audiometric testing
6. An explanation of the audiometric test procedures.
7. Where they can obtain a copy of the Occupational Noise Exposure standard in the workplace.
8. Any information materials pertaining to the Occupational Noise Exposure standard supplied to the College by OSHA.

VII. Record Keeping

A. General Requirements

1. All records required below shall be provided upon request to employees, former employees, representatives designated by the individual employee, and OSHA.
2. If the College ceases to do business it shall transfer all employee records required below to the successor employer, and the successor employer shall retain them for the remainder of the period described below.

B. Hazard Assessments

Dickinson College shall maintain an accurate record of all employee exposure measurements for a minimum of two years .

C. Audiometric Tests

Dickinson College shall retain all employee audiometric test records for the duration of the employee's employment.

This record shall include:

2. Name of employee
3. Job Classification of employee
4. Date of audiogram(s)
5. Name of examiner(s)
6. Date of the last acoustic or exhaustive audiometer calibration
7. Employee's most recent noise exposure assessment

Additionally, Dickinson College shall maintain accurate records of the measurements of the background sound pressure levels in audiometric test rooms.

D. Training Records

Dickinson College shall retain a record of each employee's training required by the Occupational Noise Exposure standard for the duration of the employee's employment.

Appendix A:

Occupational Noise Exposure Standard with Mandatory and Non-mandatory Appendices

