

Northwestern

Hearing Conservation

Program

Table of Contents

I. Program Goals and Objectives..... 2

II. Scope and Application..... 2

III. Regulatory Authority and Related Information 2

IV. Definitions 2

V. Responsibilities 2

VI. Procedures 3

VII. Hearing Protection 5

VIII. Recordkeeping 5

IX. Contact 5

Appendix 1 Audiometric Test Requirements 6

Appendix 2 Hearing Protection Information Sheet..... 7

I. Program Goals and Objectives

Northwestern University is committed to maintaining a safe and healthy work environment. It is the policy of Northwestern University to eliminate potential noise exposures through the use of effective engineering and administrative controls whenever possible. Hearing protection should be used when effective engineering and administrative controls are not feasible. This program establishes procedures for noise reduction and monitoring to prevent hearing loss from occupational noise exposure.

II. Scope and Application

This program applies to all Northwestern University personnel who are exposed to noise levels at or above a time weighted average of 85 dBA.

III. Regulatory Authority and Related Information

29 Code of Federal Regulations (CFR) Part 1910.95, Occupational Noise Exposure

29 Code of Federal Regulations (CFR) Part 1904.10, Recording Criteria for Cases Involving Occupational Hearing Loss

29 Code of Federal Regulations (CFR) Part 1910.1020 (a)-(e) and (g)-(i), Access to Employee Exposure and Medical Records

IV. Definitions

Action Level: An 8-hour time weighted average (TWA) of 85 decibels measured on the A-weighted scale, slow response, or an equivalent dose of 50%. This is the level of sound exposure at which the Northwestern University Hearing Conservation Program is mandatory.

Attenuation: The estimated reduction in the noise level at the eardrum as a result of the use of hearing protection.

A-Weighted Sound Level (dBA): The weighting of sound level that represents the function of the human ear.

Audiometric Testing: Also referred to as hearing tests

Decibel (dB): Unit of measurement of sound level

Hearing Conservation Program (HCP): A written program that establishes procedures to ensure the protection of employees from high noise areas or operations

Standard Threshold Shift (STS): 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.

Time Weighted Average (TWA): The equivalent noise level, in dB, based on an 8-hour exposure time frame.

V. Responsibilities

A. Risk Management

- i. Administrative oversight of the Hearing Conservation Program, including developing the written Hearing Conservation Program and revising as necessary;
- ii. Conduct noise monitoring surveys and maintain noise monitoring equipment;
- iii. Maintain records of exposure measurements;

- iv. Provide noise monitoring results to all employees monitored for noise exposure;
- v. Coordinate audiometric testing and training with Northwestern University Center for Audiology Speech Language and Learning (NUCASLL), Northwestern Medicine Corporate Health, or other audiometric testing center.

B. Northwestern University Center for Audiology, Speech, Language and Learning (NUCASLL) / Northwestern Medicine Corporate Health

- i. Conduct hearing tests and determine if employees experience a standard threshold shift;
- ii. Provide Risk Management with a list of employees who have experienced a standard threshold shift;
- iii. Retain hearing test results for the duration of employment;
- iv. Maintain and calibrate all audiometric testing equipment according to industry and OSHA standards;
- v. Conduct in-person employee training, if applicable.

C. Supervisors

- i. Contact Risk Management regarding potential noise exposures, including changes in the work environment and equipment that could increase noise exposure;
- ii. Ensure that employees exposed at or above TWA of 85 dBA attend annual training and receive annual hearing tests;
- iii. Provide department funds to pay for hearing tests and training;
- iv. Ensure a variety of hearing protection is provided including ear plugs and muffs;
- v. Ensure employees wear hearing protection when required.

D. Employees

- i. Follow the procedures and requirements outlined in this program;
- ii. Participate in noise monitoring activities;
- iii. Attend annual training;
- iv. Receive annual hearing tests;
- v. Wear hearing protection as required;
- vi. Notify supervisors of changes in the workplace that could change noise exposures.

VI. Procedures

A. Noise Monitoring

When a supervisor or employee suspect that an employee's exposure to loud equipment or a noisy work environment may equal or exceed an 8-hour TWA of 85 dBA, noise monitoring will be coordinated by Risk Management.

- i. Depending on the work location and frequency of operations, noise exposure monitoring will be conducted with area sound level measurements, personal dosimetry, or a combination of these techniques.

- ii. Measurements will be made with calibrated equipment operated by trained personnel from Risk Management or a designate.
- iii. Monitoring will be repeated whenever there is a change in production, process, equipment or controls that results in increased noise exposures.
- iv. Affected employees will have the opportunity to observe any noise measurements during collection and will have access to monitoring results.

B. Hearing Testing

All employees with noise exposure at or above the action level (TWA of 85 dBA) are required to participate in hearing testing which includes:

- i. Taking a baseline test within 6 months of the employee's first exposure at or above the action level. Supervisors must ensure employees are not exposed to occupational noise or properly wear hearing protectors for 14 hours prior to testing.
- ii. Annual testing is required anytime noise exposure is at or above the action level. This exceedance of the action level can occur as infrequently as one day per year.
- iii. Based on the results, follow-up testing may be required within 30 days if a standard threshold shift (STS) has been identified.
- iv. All employees will receive results in writing. If a STS has occurred, employees receive written notification within 21 days.
- v. When tests indicate a STS, the following must occur:
 - a. Employees not wearing hearing protection will be provided hearing protectors, trained in their use and care, and required to wear them.
 - b. Employees already using hearing protection will be refitted and retrained in the use of hearing protectors and provided with hearing protectors offering greater attenuation, if necessary.
 - c. Hearing protection must attenuate employee exposure to a TWA below 85 dBA. See Appendix 2 for more information on attenuation.
- vi. An audiologist will review testing results and determine if further evaluation or retraining is needed.
- vii. Audiometric testing will be provided at no cost to the employee.
- viii. See Appendix 1 for more information on audiometric testing.

C. Training

Each employee exposed to noise at or above TWA 85 dBA must receive training as follows:

- i. Upon hire and repeated annually
- ii. Information on the following:
 - a. The effects of noise on hearing
 - b. The purpose of hearing protection
 - c. The advantages, disadvantages, and attenuation of various types of hearing protection

- d. Instructions on selection, fitting, use, and care of hearing protection
- e. The purpose of audiometric testing and an explanation of test procedures
- iii. Training will be conducted via the following mechanisms:
 - a. Online at learn.northwestern.edu
 - b. In-person with NUCASLL personnel

VII. Hearing Protection

A variety of hearing protection will be made available, free-of-charge, to all employees exposed to or likely to be exposed to noise levels at or above the OSHA action level of TWA 85 dBA.

The following employees must wear hearing protection:

- i. Employees exposed to TWA of 90 dBA or more
- ii. Employees exposed to TWA of 85 dBA or more who have not taken a baseline audiogram
- iii. Employees exposed to TWA of 85 dBA who have experienced a standard threshold shift

Hearing protection guidelines are as follows:

- i. Training will be provided on the use and care of provided hearing protection.
- ii. Hearing protection will be replaced as necessary.
- iii. Hearing protection must provide a noise reduction rating sufficient to attenuate the noise below the 85 dBA action level.
- iv. See Appendix 2 for more information.

VIII. Recordkeeping

Employees may request records from the following entities:

A. Risk Management

- i. Noise monitoring data retained for thirty years
- ii. Training records retained for two years

B. Northwestern University Center for Audiology, Speech, Language, and Learning / Northwestern Medicine Corporate Health

- i. Audiometric test records retained for the duration of the affected employee's employment and to include:
 - a. Name and job classification of the employee
 - b. Date of the Audiogram
 - c. Examiner's name
 - d. Date of latest calibration of audiometer

IX. Contact

For questions contact Risk Management, Gwen Butler at gwen.butler@northwestern.edu or 847.491.4936.

Appendix 1 Audiometric Test Requirements

Audiometric testing will occur at the following locations:

**Northwestern University Center for Audiology,
Speech, Language, and Learning (NUCASLL)**

2315 Campus Drive

Evanston, IL 60208

Phone: 847-491-3165

Fax: 847-467-7141

Email: nucasll@northwestern.edu

Northwestern Medicine Corporate Health

676 N. St. Clair Street

Chicago, IL 60611

9th floor, Suite 900

Phone: 312-926-8282

Fax: 312-926-1787

Audiometric testing requirements are as follows:

- A. Audiometric tests will be performed by a licensed or certified audiologist, otolaryngologist, or other physician, or by a technician who is certified by the Council of Accreditation in Occupational Hearing Conservation, or who has satisfactorily demonstrated competence in administering audiometric examinations, obtaining valid audiograms, and properly using, maintaining and checking calibration and proper functioning of the audiometers being used. A technician who performs audiometric tests must be responsible to an audiologist, otolaryngologist or physician.
- B. Audiometric tests will 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 will be taken separately for each ear.
- C. Rooms used for audiometric testing will not have background sound pressure levels exceeding those in Table 1a.

Table 1a: Maximum Allowable Octave-Band Sound Pressure Levels for Audiometric Test Rooms

Octave-band center frequency (Hz)	500	1000	2000	4000	8000
Sound pressure level	40	40	47	57	62

- D. Audiometric tests will be conducted with audiometers (including microprocessor audiometers) that meet the specifications of, and are maintained and used in accordance with, American National Standard Specification for Audiometers, S3.6-1969, which is incorporated by reference as specified in Sec. 1910.6.
- E. Functional Operation:
 - a. The functional operation of the audiometer shall be checked before each day's use by testing a person with known, stable hearing thresholds, and by listening to the audiometer's output to make sure that the output is free from distorted or unwanted sounds.
 - b. Deviations of 10 decibels or greater require acoustic calibration.
- F. Acoustic Calibration:
 - a. Audiometer calibration will be checked acoustically at least annually.
 - b. Test frequencies below 500 Hz and above 6000 Hz may be omitted from this check.
 - c. Deviations of 15 decibels or greater require an exhaustive calibration.
- G. Exhaustive Calibration:
 - a. An exhaustive calibration will be performed at least every two years.
 - b. Test frequencies below 500 Hz and above 6000 Hz may be omitted from this calibration.
- H. Revised baseline: An annual audiogram may be substituted for the baseline audiogram when, in the judgment of the audiologist, otolaryngologist or physician who is evaluating the audiogram:
 - 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.

Appendix 2 Hearing Protection Information Sheet

Hearing protection must be worn by the following personnel:

- Employees exposed to an 8-hour TWA of 85 dBA or more who have not yet had a baseline audiogram
- Employees exposed to an 8-hour TWA of 85 dBA or more who have experienced a standard threshold shift
- All employees exposed to an 8-hour TWA of 90 dBA or more

Northwestern recommends that any employee entering a space where noise exposure may exceed 90 dBA wear hearing protection, regardless of duration of exposure.

Hearing Protection Comparison

Type	Sample Image	Advantages	Disadvantages
Ear Muffs		<ul style="list-style-type: none"> ➤ More consistent protection ➤ Usually last longer than ear plugs 	<ul style="list-style-type: none"> ➤ Protection level is decreased when wearing eye/safety glasses because the muff seal around the ear is broken by the eyeglass temple piece ➤ Can be uncomfortable to wear for long periods in hot/humid environments
Ear Plugs		<ul style="list-style-type: none"> ➤ Can be worn with glasses ➤ More comfortable in hot/humid environments ➤ Offer higher attenuation than most muffs 	<ul style="list-style-type: none"> ➤ Must seal well/fit properly to ensure adequate protection

Noise Reduction Rating (NRR) is a unit of measurement used to determine the effectiveness of hearing protection devices to decrease sound exposure within a given working environment. The higher the NRR number associated with a hearing protector, the greater the potential for noise reduction.

Attenuation is the estimated reduction in the noise level at the eardrum. A 7 dB subtraction to the NRR is used for A-weighted measurements, which is the weighting of sound most similar to human hearing. A 50% safety factor adjusts labeled NRR values for workplace conditions and is used when considering whether engineering controls are to be implemented. The 50% safety factor produces the most reliable results but is not used for enforcement purposes.

Estimated dBA exposure = TWA (dBA) – [(NRR – 7) x 50%]

e.g. If an employee is exposed to a TWA of 92 dBA and is wearing ear plugs with an NRR of 31, then their actual exposure would be 92 – [(31-7) x 0.50] = 80 dBA

Single/Double Hearing Protection

Dual hearing protection involves wearing two forms of hearing protection simultaneously (e.g. earplugs and ear muffs). Using double protection will add 5 dB of attenuation.

e.g. Using the same example as above, if the employee adds NRR 30 ear muffs over the NRR 31 ear plugs, the employee will have 80 dBA exposure minus an additional 5 dBA for a final exposure of 75 dBA.

For questions contact Risk Management, Gwen Butler at gwen.butler@northwestern.edu or 847.491.4936.