



SANFORD UNDERGROUND RESEARCH FACILITY

SOUTH DAKOTA SCIENCE AND TECHNOLOGY AUTHORITY

Hearing Conservation Standard

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Revision History

Rev	Date	Section	Paragraph	Summary of Change	Authorized by
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1.0 Purpose

This standard is established for the South Dakota Science and Technology Authority (SDSTA) to provide guidance for preventing hearing loss due to high noise levels.

2.0 Scope

This standard applies to all SDSTA personnel who may be exposed to noise hazards at or above the OSHA noise action level defined in 29 CFR 1910.0095: Occupational Noise Exposure. Stakeholders from outside organizations shall follow this standard at a minimum for noise exposures onsite.

3.0 Definitions

Action Level – The OSHA action level for noise is defined as 85 dB(A) as an 8-hour time-weighted average (TWA). However, an average of 85 dB(A) for more than 8 hours would result in a greater exposure than allowed by the OSHA standard. Given the extended work shifts at SURF, expressing noise exposures as dose provides a better measure of exposure. Thus a 50% noise dose will be used as the action level.

Area sampling – The collection of noise samples from a fixed location in a work area.

Audiometric testing – The testing of a person's ability to hear various sound frequencies. The test is performed with the use of electronic equipment called an audiometer.

Medical surveillance – Periodic medical evaluation for personnel potentially exposed to designated noise hazards.

Noise Reduction Rating – A unit of measurement used to determine the effectiveness of hearing protection devices to decrease sound exposure within a given working environment.

OSHA Noise Dose – OSHA defines noise exposures based on an 8-hour time-weighted integrated average of sound pressure levels (SPL) greater than 80 dB(A) where 8 hours at 90 dB(A) would result in 100% dose and every 5 dB increase in SPL doubles the dose.

Personal noise sampling – The collection of noise samples at the worker's hearing zone to reflect the level of a worker's exposure throughout a workday.

Standard Threshold Shift – As defined by OSHA: an average hearing shift in either ear of 10 decibels or more at the test frequencies of 2000, 3000 and 4000 Hertz.

Time Weighted Average (TWA) – The average noise exposure within the workplace using the baseline of an 8-hour per day or 40 hours per week work schedule unless otherwise specified.

4.0 Responsibilities

4.1. SDSTA Executive Director

- 4.1.1. Ensures accountability of the requirements of this standard with direct reports.
- 4.1.2. Follows all requirements within this standard.
- 4.1.3. Determines work-related hearing attenuation if an Audiologist cannot be retained.

4.2. Department Directors

- 4.2.1. Ensure that all direct reports follow the requirements within this chapter.
- 4.2.2. Follow all requirements within this standard.
- 4.2.3. Arrange for noise level assessments in areas under their control suspected to have noise levels that equal or exceed the 85 decibel TWA for noise exposure.
- 4.2.4. Ensure employees working in their departments are trained and enrolled in the Hearing Conservation Program in areas known to exceed the action level.
- 4.2.5. Consider noise levels when evaluating new equipment for purchase.
- 4.2.6. Alert Environment, Safety and Health (ESH) Department of upcoming work requiring noise level assessments.

4.3. Director of Environment, Safety and Health

- 4.3.1. Ensures that all direct reports follow all requirements within this standard.
- 4.3.2. Follows all requirements within this standard.
- 4.3.3. Revises the hearing conservation standard as needed.
- 4.3.4. Develops and implements hearing conservation training.
- 4.3.5. Works with department directors/supervisors to:
 - Identify noise hazards.
 - Conduct noise monitoring.
 - Establish appropriate noise controls.
- 4.3.6. Assures that baseline and initial audiometric exams are performed.
- 4.3.7. Arranges for annual audiometric evaluations of all employees potentially exposed above the action level.
- 4.3.8. Reports standard threshold shifts potentially caused by occupational noise to applicable authorities and stakeholders.
- 4.3.9. Approves additional types of hearing protection used at SURF.
- 4.3.10. Ensures appropriate signage is posted where locations require PPE for hearing protection.
- 4.3.11. Determines work-related hearing attenuation if an Audiologist cannot be retained.

4.4. Industrial Health (IH) Representative

- 4.4.1. Follows all requirements within this standard.
- 4.4.2. Performs or oversees noise sampling.
- 4.4.3. Evaluates hearing protection for effectiveness. Performs or oversees hearing protection attenuation testing.
- 4.4.4. Notifies supervisors and personnel of noise sampling results.
- 4.4.5. Provides concurrence that added controls are sufficient to reduce exposure below Occupational Exposure Limits (OELs).
- 4.4.6. Recommends controls to potential high noise hazards.
- 4.4.7. Recommends warning signs where appropriate.
- 4.4.8. Assists in annual audiometric testing according to Council for Accreditation in Occupational Hearing Conservation (CAOHC) standards.
- 4.4.9. Periodically reviews the hearing protection selection available from recommended vendors.

- 4.4.10.** Reviews plans for new operations and significant changes to ongoing operations that may create high noise levels.

4.5. Supervisors

- 4.5.1.** Ensure that all direct reports follow all requirements within this standard.
- 4.5.2.** Follow all requirements within this standard.
- 4.5.3.** Arrange for noise level assessments in areas under their control suspected to have noise levels that equal or exceed the 85 decibel TWA for noise exposure.
- 4.5.4.** Ensure employees working in their departments, which will be working in areas known to exceed the action level, are trained and enrolled in the Hearing Conservation Program.
- 4.5.5.** Consider noise levels when evaluating new equipment for purchase.
- 4.5.6.** Alert the ESH Department to upcoming work requiring noise level assessments.

4.6. SDSTA Personnel

- 4.6.1.** Use noise controls, including personal protective equipment provided when working in high noise areas.
- 4.6.2.** Complete hearing conservation training.
- 4.6.3.** Properly store and maintain any PPE.
- 4.6.4.** Receive audiometric monitoring and hearing protection attenuation testing.

4.7. Project Managers

- 4.7.1.** Ensure that all direct reports follow all requirements within this standard.
- 4.7.2.** Review proposed processes involving noise hazards with the ESH Department before installing new equipment.
- 4.7.3.** Inform contractors of SURF locations where noise exposures may exceed the action level.
- 4.7.4.** Inform SDSTA Personnel and/or the ESH Department of possible high noise exposures created by temporary contractor work that may affect other workplaces.

4.8. Occupational Health Registered Nurse

- 4.8.1.** Performs audiometric testing for SDSTA employees according to Council for Accreditation in Occupational Hearing Conservation (CAOHC) standards.
- 4.8.2.** Notifies employees of audiometric testing results.
- 4.8.3.** Ensures that ear cleanings are properly performed on employees where appropriate.
- 4.8.4.** Participates in the review of the Hearing Conservation Standard documents, including audiometric test results.
- 4.8.5.** Maintains records of annual audiograms for duration of employment + 20 years.

4.9. Non-SDSTA Personnel

- 4.9.1.** Follow employer's hearing conservation Standard which, at a minimum, must comply with the requirements found in OSHA's 10 CFR 1910.0095: Occupational Noise Exposure and the SDSTA Hearing Conservation Standard.
- 4.9.2.** Notify any personnel affected by noise levels generated by work and post areas where PPE is required.

5.0 Instructions

5.1. Noise Monitoring and Exposure Identification

- Due to high worker mobility and significant variations in sound level, it is difficult to determine individual employees' noise exposures based upon monitoring of those individuals. Rather, SDSTA has identified "occupational roles" that have a risk of noise exposures exceeding the action level for noise (See ESH-4000-A-004 Occupational Roles in the Hearing Conservation Program SDSTA includes employees within these "occupational roles" in the Hearing Conservation Standard. The following monitoring measures will be taken to identify these groups:
 - Noise surveys have been conducted to identify the areas where employee noise exposure may exceed 85 decibels TWA. eight-hour time-weighted average.
 - In addition to initial evaluations, routine monitoring will be performed on occupational roles affected by high noise levels.
 - Employees are monitored in questionable areas with calibrated sound-measuring equipment that measures all continuous, intermittent, and impulsive sound levels between 80-130 decibels on "A weighted" scale (slow response).
 - Each employee is notified of the monitoring results. All employees receive the proper hearing conservation training and the appropriate PPE if needed.
 - Additional monitoring may be needed if changes in process, equipment, or controls suggest that noise exposures have changed.

5.2. Hearing Conservation Program

- SDSTA employees with an overexposure to noise levels above the action level are included in the hearing conservation program. The hearing conservation program consists of the following elements:
 - Hearing protection – the use of hearing protection is required for all employee exposed to noise greater than 85 decibels TWA.
 - Annual audiograms - are required for all employees with noise exposures equal or greater than 85 decibels (8-hour TWA) during their work shift in the current year.
 - A baseline audiogram (hearing test) - will be obtained for all employees with noise exposures or expected to be exposed to noise greater than an 85 decibels TWA.
 - Training – additional hearing conservation training will be given annually.
 - Recordkeeping – an entry will be made on the ESH-3000-R-001 Incident Log & OSHA Report as a recordable illness whenever any employee experiences a Standard Threshold Shift meeting OSHA guidelines for a recordable illness.

5.3. Audiometric Testing

- Audiograms will be required by SDSTA to establish baseline hearing levels and to monitor for potential hearing loss for any member of the hearing conservation program. Audiometric testing will cover the following guidelines:
 - Audiometric testing shall be preceded by at least 14 hours without exposure to workplace noise (Hearing protectors may be used as a substitute for this requirement.). SDSTA

personnel are requested to avoid high-levels of non-occupational noise exposure during the 14 hours preceding this examination.

- o A baseline audiogram (hearing test) will be obtained for all employees with noise exposures or expected to be exposed to noise greater than an 85 decibels TWA. The baseline audiogram will be obtained within six-months of the employee's first exposure to noise above the action level.
- o Annual audiograms are required for all employees with noise exposures equal or greater than an 85 decibels TWA. Annual audiograms will first be performed onsite on a presumptive basis by an occupational hearing conservationist (OHC) certified by the Council for Accreditation in Occupational Hearing Conservation (CAOHC).
- o Any presumptive test showing a possible standard threshold shift (STS) will have a follow-up audiometric test performed by a licensed or certified audiologist, otolaryngologist, qualified physician, or qualified technician responsible to the audiologist or physician. This retest will be taken within 30 days of the first test and may be considered the annual audiogram.
- o If a standard threshold shift is confirmed:
 - ◆ The employee will be informed in writing, within 21 days of the determination.
 - ◆ The work-relatedness of the shift will be determined by an audiologist with consultation from the ESH department. If an audiologist cannot be retained, the SDSTA Laboratory Director and Director of ESH will determine work-relatedness.
 - ◆ A team consisting of operations and ESH members will review the affected employee's exposure to noise, noise controls, and the effectiveness of hearing protection. Any additional re-training, re-fitting of hearing protection, and/or other changes to noise controls will be conducted on a case-by-case basis.
 - ◆ If applicable, the employee may be referred to an audiologist, otolaryngologist, or qualified physician for further evaluation. In such cases, the medical expert will be provided with both the baseline and the most recent audiogram of the employee, and the required records on the audiometer and the audiometric test room.
- o An annual audiogram may be substituted for the baseline audiogram when the audiologist or physician evaluating the program declares:
 - ◆ A standard threshold shift is persistent (is present for two adjacent years).
 - ◆ The hearing threshold in the annual audiogram indicates a significant improvement over the baseline audiogram.
- o All audiometric testing, evaluation, and required personal protective equipment will be provided free of charge to SDSTA employees.
- o The requirements for the types and calibration of audiometers, and the background noise levels allowed in audiometric test rooms will be as specified in Appendices C, D, and E of the OSHA Noise Standard. (29 CFR 1910.0095: Occupational Noise Exposure)

5.4. Noise Controls

- Elimination/Substitution Controls Engineering Controls
 - o Eliminating and/or substituting work equipment and processes is the preferred method for controlling excessive noise exposures. This type of control is best implemented during the

work-planning phase of the job. Department directors and project managers should include noise levels whenever purchasing equipment that may exceed 85.0 dB(A).

- o Engineering Controls:
 - ◆ Engineering controls include upgrading older equipment, adding noise reduction devices, and adding material to absorb or reflect noise. A competent individual with the involvement of the appropriate departments should design engineering controls. Engineering controls are to be considered before administrative controls or personal protective equipment.
- o Administrative Controls:
 - ◆ When engineering controls prove to be infeasible or fail to reduce noise levels to below acceptable levels, administrative controls are to be implemented. Examples of this type of control include restricting access to areas or operations with increased noise exposures, planning work schedules that reduce the amount of time exposed to a noise source and providing regular maintenance to equipment to reduce noise from unlubricated parts.
- Personal Protective Equipment (PPE)
 - o When PPE is Required
 - ◆ If the above controls prove to be infeasible or fail to reduce noise levels to below an 85 TWA, PPE will be used. Hearing protection is required to be worn and is provided for all employees with noise exposures:
 - ◇ Greater than an 85-decibels TWA.
 - ◇ Greater than an 85-decibels TWA and who have experienced a standard threshold shift.
 - ◆ If workers' noise exposure levels meet or exceed an 8-hour time weighted average of 100 dBA, accounting for sound levels between 90 dBA to 140 dBA, the noise falls under the Dual Hearing Protection Level. At this level, you must provide muff- and plug-type hearing protectors in addition to the requirements specified for noise exposure that meets or exceeds a PEL.
 - ◆ Hearing protection will be available for use to all employees with noise exposures above 85 dB(A) and will be provided at no cost to employees with a variety of suitable types available for their selection.
 - o Hearing Protection Availability and Criteria
 - ◆ Hearing protection is available in many areas onsite and remain a stock item at the Warehouse. Any additional types of hearing protection used onsite will need to be approved by the ESH Department. The ESH Department periodically reviews the hearing protection selection available from its recommended vendors.
 - o Evaluation of Hearing Protection Effectiveness
 - ◆ Each type of hearing protection used onsite will be evaluated by the ESH Department for their ability to adequately reduce the noise exposures in the workplace to an 8-hour TWA of 85 dBA or less. Two methods are used by the ESH Department to evaluate the effectiveness of hearing protection. The preferred method is to determine the Personal Attenuation Rating (PAR) of the individual being evaluated. SDSTA uses the Integraft Real Ear Attenuation system to test the effectiveness of the type of earplugs typically worn

by the worker. The PAR is then subtracted from the noise exposure TWA to determine if the hearing protection effectively reduces the noise level under occupational limits.

- ◆ Another method for evaluating hearing protectors is to refer to the Noise Reduction Rating (NRR) listed on the hearing protector package. To adjust the rating to an A-weighted scale, 7 dB will be subtracted from the NRR. This method will only be used if a PAR was not obtained.
- ◆ In both methods, the addition of earmuffs for dual hearing protection adds an additional 5 dB of protection, regardless of the NRR.
- ◆ Locations requiring PPE for hearing protection shall be signed accordingly.

5.5. Training

- Annual training programs will be required for employees included in the Hearing Conservation Program. Elements incorporated into this training include:
 - The effects of noise on hearing.
 - The purpose of hearing protectors.
 - The advantages, disadvantages, and noise reduction capabilities of the various types of hearing protectors.
 - Instructions on the selection, fitting, use, and care of hearing protectors.
 - The purpose of audiometric testing and an explanation of the test procedures.
- The ESH Department will provide a copy of the OSHA Hearing Conservation Program standard (29 CFR 1910.0095: Occupational Noise Exposure) to any employee upon request.

5.6. Recordkeeping & Reporting

- The following records will be maintained, and will be available upon request, to our employees:
 - Noise exposure records will be maintained by the ESH department for a minimum of two years. Hard copies of these records are located in the Industrial Hygiene/Safety Specialist's office, and electronic copies are located on the network.
 - Hearing Conservation Program training will be maintained on the ESH training records database. Contact the ESH Department for all training requests regarding this program.
 - All audiometric testing records will be retained for the duration of each worker's employment and will include:
 - ◆ Audiogram with the name and job classification of the employee, date of the audiogram and the examiner's name.
 - ◆ Measurements of the noise levels in the audiometric test booth and the date of the last acoustic or exhaustive calibration of the audiometer.
 - ◆ Audiometric testing records are located in the site Occupational Health Registered Nurse office.

6.0 Documented Information/Related Document

- 6.1. ESH-3000-R-001 Incident Log & OSHA Report
- 6.2. ESH-4000-A-004 Occupational Roles in the Hearing Conservation Program
- 6.3. 29 CFR 1910.0095: Occupational Noise Exposure (OSHA)
- 6.4. National Institute For Occupational Safety and Health (NIOSH): Preventing Occupational Noise-Induced Hearing Loss
<https://www.cdc.gov/niosh/topics/noise/preventoccnoise/provide.html#:~:text=Too%20much%20sound%20reduction%20can,or%20greater%20or%20impulse%20sounds.>
- 6.5. CAOHC OHC Certification