

# **Hearing Conservation**

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# 1. SCOPE AND APPLICATION

The purpose of the Hearing Conservation Program (HCP) at Clemson University (CU) is to establish and maintain a program, in compliance with the OSHA Occupational Noise Exposure Standard (OSHA 29 CFR 1910.95). HCP is designed to ensure that CU Personnel who are exposed to high noise levels are adequately protected and receive appropriate training. The HCP shall apply whenever employee noise exposure equals or exceeds an 8-hour time-weighted average (TWA) sound level of 85 decibels, measured on the A scale (slow response) or a dose of fifty percent as measured by a noise dosimeter. Noise exposure includes continuous, intermittent and impulse (less than one second long and greater than one second delay) noises. Sound level measurements will determine excessive noise exposure and engineering or administrative controls will be used to reduce exposure. If these measures do not reduce the noise level sufficiently, employee training, hearing exams, and personal protective equipment (ear plugs or muffs) will be necessary. Continued exposure to intense noise can result in permanent hearing loss. If individuals, in close-proximity, shout to communicate over noise(s), the noise level is likely at an amplitude to cause a temporary or permanent hearing loss (threshold shift).

# 2. DEFINITIONS

- **Action Level** is defined as the 8-hour TWA at or above 85 decibels (dBA) measured on the A-weighted scale, slow response, or equivalently a dose of 50%. This is the level of sound at which an employee must be enrolled in the University Hearing Conservation Program.
- **Administrative controls** are defined as established work practices that reduce the duration, frequency, or intensity of exposure to hazards. These include required training, Standard Operating Procedures (SOPs), Signage, Access control, Compliance actions: record keeping, inspections, evaluations, enforcement; and/or other controls such as: worker-machine rotation, breaks from noise, entry safety briefs, etc....
- **Attenuation** is the reduction in sound pressure level in dB which occurs as a person moves further away from a noise source (i.e. moving out of doors or down an air-conditioning duct system).
- **A-Weighted Sound Level (dBA)** is the weighting of sound levels that represents the function of the human ear.
- **Audiogram** is the chart, graph, or table showing hearing threshold level as a function of frequency; a method of measuring degree of hearing loss.
- **Audiologist** is a professional, specializing in the study and rehabilitation of hearing, who is certified by the American Speech-Language-Hearing Association or licensed by a state board of examiners.
- **Audiometric Testing Program** is the portion of the Hearing Conservation Program that consists of measuring an employee's hearing threshold to determine a baseline and for subsequent comparisons. An annual audiogram is required thereafter.
- **Continuous noise** is a type of constant, unchanging noise which is generated by turbines, air conditioners or fans.
- **Criterion sound level** is the decibel level at which the permissible exposure level is reached; for OSHA, criterion is 90 dBA (which will result in a maximum dose of 100%).
- **Decibels (dB)** is the unit of measurement of sound level.
- **dB(A)** is a unit of measurement of sound level in dB using a weighting network of the A scale on a sound level meter. A-weighting is a pitch/frequency response filter adjustment which makes its reading conform, very roughly, to the human ear response at a loudness level of 40 phon.
- **Dosimeter** is a special battery-powered sound level meter that monitors for noise exposure. It continuously computes TWA and noise dose using a specified exchange rate for trading sound level and exposure duration. The rate for OSHA is 5dB increase, per half time.
- **Engineering controls**, the preferred method of noise exposure control, reduce the noise level (below OSHA PELs) at its source by elimination, substitution, and/or other controls such as: quieter machinery, noise path absorbers or barriers, mufflers, or equipment isolation.
- **Exchange or doubling rate** is defined as how dB value and exposure duration are exchanged or traded. (Dosimeters use 3dB or 5dB rate). OSHA recommends using a 5dB rate.

- **Frequency** is the measure of the rapidity of alterations of a periodic acoustic signal, expressed in cycles per second, or Hz. Commonly known as pitch.
- **Hearing Conservation Program (HCP)** is required by the Hearing Conservation Standard which requires that a hearing conservation program be administered when employee noise exposures are 85dBA TWA on slow meter response. This corresponds to a 50% noise dose. This is called the OSHA action level.
- **Hertz (Hz)** is the unit of measurement of frequency, numerically equal to cycles per second.
- **Impact-type noise** is the type of impact noise generated by the impact of drop hammers and punch presses on another surface. This type of noise is described as "transient" as it is less than one second in duration, which may be repeated after a delay of more than one second.
- **Intermittent noise** is the type of noise exposure that an employee is exposed to while moving through the work environment several times during a normal working day (i.e. the inspector or facility supervisor who periodically makes trips from a relatively quiet office into noisy production areas may be subject to this type of noise).
- **Noise dose** is the ratio, expressed as a percentage, (1) the time integral over a stated time or event to 0.6 power of the measured SLOW exponential time-averaged, squared A-weighted sound pressure and (2) the product of the criterion duration (8 hours) and the 0.6 power of the squared sound pressure corresponding to the criterion sound level (90 dB).
- **Noise Dosimeter** is an instrument that integrates a function of sound pressure over time in such a manner that it directly indicates a noise dose.
- **Noise Reduction Rating (NRR)** is the Hearing Protection Device manufacturer's single number attenuation rating based on idealistic laboratory measurements across a range of frequencies.
- **Noise-Induced Permanent Threshold Shift (NIPTS)** is hearing loss suffered as the result of noise exposure, all or part of which is permanent.
- **Permissible Exposure Limit (PEL)** is the eight-hour, time-weighted average noise level that must not be exceeded. The OSHA PEL is 90 dBA per 8-hour day with a 5dB exchange rate.
- **Personal Protective Equipment (PPE)** is, in this case, a hearing protection device provided to the employee by the employer and used to reduce sound levels to within OSHA PEL limits, if other controls fail to reduce sound levels within OSHA PEL exposure limits.
- **Projected Dose** projects an 8-hour dose from the sample obtained in less than 8 hours. Most accurate if noise levels are constant.
- **Phon** is a unit of loudness level for pure tones. Its purpose is to compensate for the effect of frequency on the perceived loudness of tones.
- **Representative exposure** measures an employee's noise dose or 8-hour time-weighted average sound level that the employers deem to be representative of the exposures of other employees in the workplace.
- **Temporary Threshold Shift (TTS)** is hearing loss suffered as the result of noise exposure, all or part of which is recovered over time, after removal from the noise source.
- **Time-Weighted Average (TWA)** is the sound level which, if constant over an eight-hour exposure, would result in the same noise dose as is measured.
- **Training program** is required annually, concerning effects of noise on hearing, use of hearing protective devices, and the purpose/necessity of audiometric testing.

## 3. RESPONSIBILITIES

### 3.1. OCCUPATIONAL AND ENVIRONMENTAL SAFETY (OES)

OES is responsible for the development, implementation, and administration of the Hearing Conservation Program (HCP). These responsibilities include:

- Reviewing and updating the Hearing Conservation written program.
- Conducting noise surveys of the Clemson University work environment to determine areas or activities of elevated noise levels.
- Providing a written report to communicate results and recommendations from noise surveys.

- Determining the need for hearing protection.
- Cooperating with CU Departments to assure compliance.
- Providing training to personnel on the proper use, maintenance and storage of hearing protection.
- Evaluating the overall effectiveness of the hearing conservation program.
- Providing signage and decibel labels.

## **3.2. OCCUPATIONAL HEALTH NURSE**

The Occupational Health Nurse is responsible for:

- Maintaining all medical records associated with this program.
- Providing preplacement and evaluations of baseline and annual audiograms
- Notifying employees in offsite locations of local audiologists who perform preplacement evaluations and evaluations of baseline and annual audiograms.

## **3.3. DEPARTMENT HEAD/SUPERVISOR/PI**

Departments whose employees may be exposed to excessive noise hazards are responsible for providing appropriate resources including personnel, equipment, and financial support. Departments are primarily responsible for ensuring implementation of the HCP in their areas and are responsible for:

- Helping identify potential areas of concern and document areas of excessive noise.
- Requesting that OES evaluate potential high noise operations.
- Assisting OES in identifying employees who are over the Action Level.
- Maintaining a list of employees who require hearing protection and ensure HCP enrollment, training and audiometric exams are provided.
- Providing appropriate hearing protection devices to employees and ensure hearing protection is worn correctly.
- Posting: Noise Hazard and Hearing Protection Required signage.
- Monitoring staff to ensure compliance with HCP.

## **3.4. EMPLOYEES ENROLLED IN THE HEARING CONSERVATION PROGRAM**

Employees are responsible for:

- Wearing approved hearing protection devices in posted noise hazard areas and during tasks identified with potential noise exposure greater than 85 A-weighted decibels (dBA).
- Complying with all HCP requirements.
- Attending all scheduled audiogram appointments
- Completing required initial and annual HCP training.
- Maintaining and storing Hearing Protection Devices in good sanitary condition and proper working order.
- Reporting noise hazards and hearing protection problems to their supervisors.

# **4. NOISE MONITORING**

Employees should notify their supervisor of areas or equipment with excessive noise. The supervisor should contact OES to schedule noise monitoring. The employee and/or supervisor may observe the noise monitoring procedure conducted by OES.

OES will conduct direct read measurements and/or collect Noise Dosimetry samples to determine employee exposure to noise and identify work areas and/or equipment sources contributing to noise exposure. OES will assess the work activities in the potential high noise area and conduct an initial noise survey using a

sound level meter to determine if noise levels are above 85dBA. If noise levels are above 85dBA and the duration of employee time working in the area would be sufficient to result in overexposure, a noise dosimeter will be placed on the employee to determine if OSHA's 8-hr TWA Action Level of 85dBA is exceeded.

Any employee whose exposure meets or exceeds the OSHA action level of 85 dBA, as an 8-hour the time-weighted average using a 5 dB exchange rate, will be enrolled in the Hearing Conservation Program and will be required to wear hearing protection. These employees will receive audiometric testing, will be trained on the fitting, use, and care of hearing protection devices, and will be provided with hearing protection devices.

Upon completion of monitoring, written notification of the exposure monitoring results will be provided to the employee by OES.

- Employees whose exposure exceeds the Action Level of an 8-hour TWA will be enrolled into HCP.
- Employees whose noise exposure levels do not exceed the 85dBA 8-hour timeweighted average will not be enrolled in the HCP and will not require any additional monitoring unless there are changes in the work duties, equipment, or a significant change is perceived in the workplace noise levels.

The areas where hearing protection should be worn should be posted to alert employees to the required use of hearing protection. Equipment with a noise level of 85 dBA or greater should be labeled with the appropriate decibel reading.

## **5. MEDICAL EVALUATIONS AND AUDIOMETRIC TESTING**

Once determined employee exposure to noise will exceed the OSHA action level, the employee must be enrolled in the Clemson University Hearing Conservation Program and Clemson University's Medical Surveillance Program.

The OHN will provide preplacement and evaluations of baseline and annual audiograms. The cost of testing and hearing protectors will be covered by the employee's department.

### **5.1. AUDIOMETRIC TESTING**

Individuals enrolled in the Hearing Conservation Program must participate in annual audiometric testing. The cost of this test will be covered by the employee's department. Prior to work-related noise exposure, the employee should be given a baseline audiogram within 6 months of hire. Additional audiograms will be compared against the baseline audiogram. If the employee shows a standard threshold shift, they will be notified in writing within 21 days upon determination. The employee should be retrained on the hazards and precautions of working in a noisy environment, if needed the employee will be reissued hearing protection devices. Audiometric testing will be conducted and evaluated in accordance with 29 CFR 1910.95.

## **6. HEARING PROTECTION DEVICES**

Individual departments are responsible for providing employees who are exposed at or above the 85dBA Action Level or will be expected to work in areas with posted or designated "Hearing Protection Required," signs with adequate hearing protection. Hearing protection will be provided at no cost to the employee and replaced when broken, defective, or soiled. Hearing devices may include earplugs or earmuffs with at least two types made available for selection by the wearer.

The ability of hearing protection to reduce noise is measured as the Noise Reduction Rating (NRR). The greater the NRR, the better the noise attenuation. The NRR is typically found on Hearing Protection device, packaging and/or manual.

OES can help assess and determine the appropriate types of hearing protection needed for specific jobs, equipment, and situations. OES will provide training on proper Hearing Protection wear, use, and maintenance.

Managers, supervisors, and/or PIs are responsible for hearing protection availability and proper use by subordinates. Trained HCP employees are responsible for following the guidelines and recommendations set forth by OES and 29CRF1910.95.

## **7. TRAINING**

OES will provide initial and annual training for all employees enrolled in the HCP. The training will cover,

- Relationship between noise and hearing over time
- Hearing protection purpose
- Hearing protection device types and functions
- Selection, use, fitting and care of hearing protection devices
- Audiometric testing purpose and procedures.

## **8. RECORDKEEPING**

OES will maintain all records of personal noise exposure monitoring. Records will be retained for the duration of employment plus 30 years.

The Clemson University Occupational Health Nurse will maintain all audiometric testing records for HCP employees.

All records are available to individual employees upon request.