



# Hearing Conservation Program

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## **I. Purpose**

Texas Christian University intends to provide every employee with a safe and healthful working environment. Any faculty or staff members who, during their employment activities, are exposed to a level greater than 85 decibels on the A scale (dBA) should be protected. Prevention of occupational hearing loss is the primary goal of this program.

## **II. Definitions**

- A. Action Level** - An 8 hour time-weighted average (TWA) of 85 decibels measured on the A-scale (dBA), slow response, or equivalently, a dose of 50 percent.
- B. Audiogram** - A chart, graph, or table resulting from an audiometric test showing an individual's hearing threshold levels as a function of frequency.
- C. Noise dosimeter** - An instrument that integrates a function of sound pressure over a period of time in such a manner that it directly indicates a noise dose.
- D. Attenuate** - To reduce or weaken.
- E. Standard threshold shift** - A change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000 and 4000 Hertz in either ear.

## **III. Responsibility**

### **A. TCU Risk Management**

1. These guidelines been developed by TCU Risk Management who will coordinate and review, annually, the Hearing Conservation Program for TCU.
2. The Safety department will conduct noise monitoring upon request from the individual departments that are concerned with possible exposures in their units.
3. Training will be provided or coordinated through TCU Risk Management.
4. TCU Risk Management will assist departments in choosing and fitting hearing protection devices, when requested.
5. At no cost to the employee, departments will provide at-risk individuals with baseline audiograms and annual audiogram follow-ups.
6. Maintain record keeping.

### **B. Individual Departments**

1. Identify potential areas of concern. The Safety department will then monitor to determine which work areas or procedures require participation in the Hearing Conservation Program.

2. At no cost to the employee, departments will provide a choice of hearing protection devices (earplug or earmuff) and ensure that they are being worn.

**C. Miller Speech & Hearing Clinic**

1. Conduct audiometric evaluations and review audiograms.
2. Provide written reports to the employee and TCU Risk Management.
3. Provide immediate feedback to employee regarding audiogram results.
4. Make referrals for otological/audiological evaluation and treatment.
5. Assist in providing educational programs regarding hearing conservation to employees and supervisors/administrators.

**IV. Hearing Conservation Program**

- A. When a sound survey determines that an employee is exposed to noise equal to or greater than an 8-hour time-weighted average (TWA) of 85 dBA (slow response) or, equivalently a dose of 50 percent, the affected department shall institute the Hearing Conservation Program.
- B. The preferred method of hearing conservation is to control noise at its source through changes in machinery or equipment, changes in manual or mechanical materials handling, installing controls on vibrating surfaces, enclosing machinery, dampening with absorbents, insulating rooms, administrative controls, or other engineering controls.
- C. The key elements of an effective Hearing Conservation Program are:
  1. Noise exposure measurements
  2. Engineering and administrative noise exposure control
  3. Personal hearing protection
  4. Baseline and annual audiograms
  5. Training

**V. Noise Exposure Monitoring**

- A. Supervisors are responsible for identifying potentially harmful noise levels at the work site. The supervisor may suspect potentially harmful noise levels when noise at the work site routinely interferes with verbal communication; when noise routinely startles, annoys, or disrupts an employee's concentration; or when it is the suspected cause of noticeable hearing loss or pain. See Appendix A for of relative noise levels.
- B. When a supervisor suspects harmful noise levels, they should contact TCU Risk Management. The Safety department will then measure the noise level at the work environment.
- C. When information indicates that a noise exposure may equal or exceed an 8-hour TWA of 85 dBA (action level), monitoring will be conducted to document the

exposure and decide whether or not the Hearing Conservation Program should be implemented.

- D. Representative samples, either through personal or area sampling, will be conducted to ensure that all affected employees who need to be included in the Hearing Conservation Program are identified. The monitoring will be conducted using area noise meters or personal noise dosimeters, as appropriate.
- E. Monitoring will be repeated whenever a *change* in production, process, equipment, or controls increases noise exposures 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.
- F. Upon determination that the action level is exceeded, the Safety department will notify the supervisor of the situation. The supervisor and the Safety department will begin the process to identify the employees that would be subject to this program.
- G. Employees who are exposed at or above the action level will be notified of the results of the noise survey.
- H. Each employee, or their representative, shall be given the opportunity to observe any noise measurements as they are being conducted.
- I. All continuous, intermittent, and impulsive sound levels from 80 dB to 130 dB will be integrated into the noise measurements.

<b>Permissible Noise Exposures</b>	
<b>Duration per day – hours</b>	<b>Sound level – dBA (slow response)</b>
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

**VI. Audiometric Testing Program**

- A. All employees exposed to a TWA of 85 dBA or greater will be included in the audiometric testing program. This consists of a baseline audiogram and annual audiograms thereafter.

- B.** The audiometric testing program will be conducted by Miller Speech & Hearing Clinic, or as contracted by TCU Risk Management. Audiometric tests and evaluations shall be conducted by a qualified physician, otolaryngologist, audiologist, or certified technician.
- C.** Each annual audiogram will be evaluated to determine if a standard threshold shift has occurred. If a standard threshold shift has occurred, a retest will be given within 30 days. The audiograms will be reviewed and a determination will be made whether there is a need for further evaluation or recommendations will be made.
- D.** New employees, or those identified as being newly covered by this program, will have two (2) weeks to make an appointment with Miller Speech & Hearing for a baseline audiometric test.

## **VII. Hearing Protectors**

- A.** Hearing protectors shall be worn by any employee who is exposed to an 8-hour TWA of 85 dBA or greater or who:
  - 1. Has not yet had a baseline audiogram.
  - 2. Has experienced a standard threshold shift. Hearing protectors shall also be worn by any employee (or visitor) who enters an area where hearing protectors are required.
- B.** Employees shall be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors provided by their department.
- C.** Hearing protectors chosen for use in the Hearing Conservation Program should provide attenuation of noise to less than 85 dBA (if fitted and worn properly).
- D.** Each department shall ensure proper initial fitting and correct use. Supervisors shall enforce the wearing of hearing protectors.

## **VIII. Training**

- A.** Each employee who is exposed to noise at or above an 8-hour TWA of 85 dBA shall be trained. Training will be provided annually. Information provided in the annual training program will be updated to be consistent with changes in protection devices and work processes.
- B.** The training will include, but is not limited to, the following:
  - 1. The effects of noise on hearing.
  - 2. The purpose of hearing protectors, the advantages, disadvantages, attenuation of various types, and instructions on selection, fitting (hands-on), use, and care.
  - 3. The purpose of audiometric testing, and an explanation of the test procedures.

**IX. Recordkeeping**

- A.** The Safety department will retain noise exposure measurements for at least 2 years.
- B.** The Safety department will retain employee training records for the duration of the employee's employment.
- C.** The Workers' Compensation Coordinator and Miller Speech & Hearing will retain audiometric test records for the duration of the employee's employment.
- D.** Upon request, the department or TCU Risk Management will provide employees with a copy of 29 CFR 1910.95 (Occupational Noise Exposure standard), the Hearing Conservation Program and any records required to be kept under this standard. Audiometric test results will only be discussed and provided to the affected employee.

## Appendix A – Relative Noise Levels

Detection of the *Action Level* (85 dB) to initiate the Hearing Conservation Program is difficult without proper instrumentation. However, a rule of thumb is if you have to raise your voice to be heard, then the noise level may exceed the Action Level. This is illustrated in the table below.

Relative Noise Levels	
Common Sounds	Decibels (dB)
Medium Jet Engine	160
<i>Threshold of Pain</i> /Riveting or Chipping	140
Woodworking/Punch Press	110-120
<b>Avoid exposures above this level</b>	<b>115</b>
Printing Press	110-110
Busy Office/Very Noisy Restaurant	80
Normal Speech at 3 feet/Freight Train at 100 feet	60-70
Quiet Office/Audiometric Booth	40-50
Whispering	20-30
<i>Threshold of Hearing</i>	0

The most common unit of measure in the workplace is the Decibel (dB). By definition, this is a dimensionless unit that is a ratio between a quantity being measured and a reference value. For noise measurement, the scale goes from the value for the *threshold of hearing* to the value for the *threshold of pain* -- a change nearly 10 million times greater. For this reason, this ratio is measured on a logarithmic scale rather than an actual scale.

- A. The overall noise level for multiple noise sources cannot be added together. Where multiple noise sources or reduction devices are found in a work area, some confusion can occur as to what effect this may have on the noise level. It would be nice to be able to add noise levels together and come up with a single value. Since noise levels are measured on a logarithmic scale, this is not possible. For example, if two 60 dB sources of noise are found in the workplace, the resulting noise level is not 120 dB, but only 63 dB.

Where two sources are involved, it is easier to use the following table:

Difference in dB	Add to Higher Value
0-1 dB	3 dB
2-3 dB	2 dB
4-9 dB	1 dB
10+ dB	0 dB

Examples:     83 dB + 82 dB = 86 dB  
                   83 dB + 80 dB = 85 dB  
                   83 dB + 73 dB = 83 dB



- B.** Although an individual may be exposed to a noise level above the Action Level (85 dB) for part of the day, this may not qualify them to be covered under the Hearing Conservation Program.

It should be remembered that the TWA (time-weighted average) is based on the amount of noise that an individual would be exposed to during a typical eight-hour workday. In most cases, an individual would rarely be exposed to a steady 85 dB noise level for an entire workday. It is more common for a person to be exposed to a variety of sound levels for varying lengths of time. For example, 2 hours @ 85 dB, 4 hours @ 80 dB, and 2 hours @ 87 dB would result in a TWA of about 83.6 dB.

Although expectations would be that the Action Level is exceeded, and the individual would fall under the Hearing Conservation Program, the appropriate calculations indicate otherwise. The supervisor's role in identifying potential problems is important.

- C.** Audiometric testing (hearing tests) should be performed at the time an individual is first exposed to excessive noise, then annually thereafter.

Even without exposure to industrial noise, hearing loss for the average person increases with age.

Exposure to excessive noise in the workplace can "hurry" this process along. To monitor the amount of hearing loss resulting from industry-related exposures, audiometric tests are performed when an exposure is first determined (baseline test) then compared to annual follow-up tests.

- D.** The Standard Threshold Shift (STS) is the key to identifying changes in hearing ability. The STS is defined as the average shift in either ear of 10 dB at the frequencies of 2000-, 3000-, and 4000-Hz. This can be determined only by comparing an annual test with a baseline test. If an STS occurs, then the individual will be notified within 21 days. Additional testing may be required if the shift is caused by the use of hearing protectors. If it is not caused by hearing protectors, then the individual will be referred to their physician.

- E.** Hearing loss is accumulative, always wear hearing protection around noise sources. This brings up the point that hearing loss can be viewed as being accumulative. Once it occurs, whether by a small amount or a large amount OR over a long time period or short time period, there is no returning back to your original hearing ability. To minimize the amount of hearing loss in the workplace, hearing protection should always be worn around noise sources.

- F.** Hearing protection comes in four basic categories; enclosures, earplugs, canal caps, and earmuffs.

The typical hearing protector can reduce -- depending on frequencies -- the amount of sound reaching the ear from 35 dB to 50 dB.

ENCLOSURE: This type of protection would envelop the entire head, such as a helmet worn by an astronaut. Up to an additional 10 dB reduction can be expected when combined with other hearing protection. It is not expected that this extent of protection is needed on campus.

EARPLUGS: This type of protection is usually made from foam, rubber, or soft plastic. It is designed to be inserted into the canal of the ear without causing damage. Earplugs fall into three broad categories: *formable*, *custom-molded*, and *pre-molded*. Typical of *formable* are foam plugs that can be easily formed to fit into the canal. *Pre-molded* types include the three-flange plastic style plugs that cannot be formed to fit the ear canal. These are the two most likely earplugs to be used and are designed for one time use. *Custom-molded* earplugs will not normally be encountered in the workplace. The advantage of earplugs is the ease of carrying and that they are cooler to wear during the summer compared to earmuffs.

CANAL CAPS: This type of protection is designed to plug the entrance to the ear canal. These generally look like to foam cones with a headband attached. Under normal circumstances, this type of protection will not be found in the workplace.

EARMUFFS: This type of protection consists of two cup-shaped devices attached to a headband and designed to fit over the external ear. The advantages to this type is the ease of use when wearing it and not having to carry several pair of earmuffs like you would earplugs. They can be hot in the summer and difficult to carry from jobsite to jobsite. This type of protection can typically be found in the workplace.

- G.** Hearing protector attenuation should be sufficient enough to reduce exposure to a TWA value of 85dB.

The most convenient method for doing this is the NRR (Noise Reduction Rating) system developed by the EPA. The NRR is shown on the hearing protector packaging. At the university, the NRR rating will be applied in the following fashion:

$$[\text{TWAA-Weighted} - (\text{NRR} - 7 \text{ dB})] = \text{Est. Level of Exposure}$$