# Illinois State University

## Hearing Conservation Program

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Section 1.0 Objective
In an effort to protect university employees from work related, noise induced, hearing impairments, the Illinois State University Hearing Conservation Program (HCP) has been established to:

- identify areas or operations on campus that produce noise levels at or above 85 dB,
- provide protection against identified hazards,
- administer engineering/administrative controls to reduce workplace noise levels, and,
- provide audiometric evaluations to identify occupational hearing loss.

**Overview**

The Environmental Health and Safety Office (EHS) will oversee the HCP. EHS will be responsible for conducting personal monitoring and area audiometric monitoring to identify areas and occupations to be included in the HCP. Protection against the effects of noise shall be provided when employees are subjected to sound levels at or above 85 dB. Feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels or are impractical, personal protective equipment shall be provided and used to attenuate noise to acceptable levels.

Occupational groups identified in Appendix III are included in the Hearing Conservation Program (HCP). Personal monitoring and work space monitoring has confirmed their noise exposures have the potential to be at or above 85 dBA as an 8 hour Time Weighted Average (TWA) during the course of their normal work duties. Those occupations included in the HCP will obtain audiometric evaluations as required by 29 CFR 1910.95 (g).

The dual purpose of the evaluations is to identify noise induced hearing loss as well as evaluate the effectiveness of existing attenuation practices. Departments included in the HCP will be responsible for coordinating employee education and training. Educational training shall include:

- the effects of noise on hearing, purpose of hearing protection,
- instructions on the type, fit and use of hearing protection, and,
- the purpose of the audiometric test and an explanation of the test procedures.

Annual awareness training will be conducted through all the trade groups.
Section 2.0  Definitions

**Audiogram:** Graph of hearing threshold level as a function of frequency.

**Decibel, A-weighted (dBA):** Unit representing the sound level measured with the A-weighting network on a sound level meter.

**Hearing threshold level (HTL):** For a specified signal, amount in decibels by which the hearing threshold for a listener, for one or both ears, exceeds a specified reference equivalent threshold level.

**Impact:** Single collision of one mass in motion with a second mass that may be in motion or at rest.

**Impulse:** Product of a force and the time during which the force is applied; more specifically, impulse is the time integral of force from an initial time, the force being time-dependent and equal to zero before the initial time and after the final time.

**Impulsive noise:** Impulsive noise is characterized by a sharp rise and rapid decay in sound levels and is less than 1 sec in duration.

**Intermittent noise:** Noise levels that are interrupted by intervals of relatively low sound levels.

**Noise:** (1) Undesired sound. By extension, noise is any unwarranted disturbance within a useful frequency band, such as undesired electric waves in a transmission channel or device. (2) Eratic, intermittent, or statistically random oscillation.

**Noise reduction rating (NRR):** The NRR, which indicates a hearing protectors noise reduction capabilities, is a single-number rating that is required by law to be shown on the label of each hearing protector sold in the United States.

**Standard Threshold Shift (STS)** “A hearing level change, relative to the baseline audiogram, of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear.”

**Significant threshold shift:** A shift in hearing threshold, outside the range of audiometric testing variability (5 dB), that warrants follow up action to prevent further hearing loss. NIOSH defines significant threshold shift as an increase of HTL of 10 dB or more at any frequency (500, 1000, 2000, 3000,4000, or 6000 Hz) in either ear that is confirmed for the same ear and frequency by a second test within 30 days.

**Temporary threshold shift:** Temporary increase in the threshold of audibility for an ear caused by exposure to high-intensity acoustic stimuli. Such a shift may be cause by other means such as use of aspirin or other drugs.
**Time-weighted average (TWA):** The averaging of different exposure levels during an exposure period typically over 8 hours.

**Section 3.0 Noise Exposure Monitoring**

The identification of noise hazards will be coordinated between affected departments and EHS. Noise monitoring and work space evaluations will be conducted to:

- identify spaces where noise exposures have the potential to be at or above 85 dB. (Appendix II)
- when employees express a concern about the level of noise in their work area or,
- when employees notify EHS they believe they are suffering from noise induced hearing loss.
- when conditions in the workplace make conversation difficult.
- an audiogram indicates a 10 dB STS.

Re-evaluations of noise exposure will be conducted when changes or additions to equipment, space or operations significantly alter noise exposure.

Noise hazard evaluations will be based on the results from area noise monitoring and personal dosimeter results. Area surveys will measure environmental noise levels to identify areas where employee exposures are at or above 85 dB, as well as to identify where more thorough exposure monitoring may be needed. Employees who have jobs that make them highly mobile will use body-worn dosimeters to monitor exposures during their work shifts. All continuous, intermittent, and impulse sound levels from 80 dB to 130 dB will be integrated into noise measurements.

Results from personal dosimeter and area monitoring will be used to categorize noise exposures in Similar Exposure Groups. When considering the amount of daily noise exposure, their combined effects will be evaluated rather than the individual effect of each exposure. Employees shall be notified whenever monitoring results meet or exceed 85 dBA as an 8-hour Time Weighted Average, (TWA). All monitoring shall be performed to meet the standards set by 29 CFR 1910.95 (d) and compared to known time exposure standards listed in Appendix I.

Employees shall be provided the opportunity to observe monitoring and to have the results of that monitoring explained to them. If an employee does not wish to observe monitoring, he/she can choose a representative as a substitute in the observation of noise exposure monitoring.
Section 4.0 Engineering and Administrative Controls to Reduce Noise Exposure

When employees are exposed to sound levels at or above 85dBA TWA, or if impact or impulse noise exceeds 140 dB, administrative or engineering controls shall be utilized. The use of engineering/administrative controls will reduce noise exposure to the point where the hazard to hearing is eliminated or at least more manageable. Noise levels will be considered continuous if, maximum noise levels occur at intervals of one second or less.

Engineering Controls

Engineering controls shall be used, whenever possible, to reduce noise exposure by:

- reducing noise at the source,
- interrupting the noise path,
- reducing reverberation, or
- reducing structure-borne vibration.

The design of engineered noise controls shall be such as to not interfere with work posture (bending, standing, sitting etc.) or environmental conditions (light, temperature, etc.).

Administrative Controls

Whenever possible, work schedules shall be so designed as to reduce exposure times by either limiting the number of employees exposed or by switching an employee to a less noisy job once his/her dose reaches the action level. Signage is posted at entry to points to work areas where noise levels exceed 85dBA, indicating “NOISE LEVELS IN THIS SPACE ARE KNOWN TO EXCEED 85dBA HEARING PROTECTION IS RECOMMENDED”. These areas were identified through a noise survey and a list is available in (Appendix II). The list is updated periodically as changes of equipment or work habits warrant.

Section 5.0 Audiometric Evaluations

The university shall provide audiometric testing, at no cost to the employee, whose exposure is equal to or exceeds 85dBA as an 8-hour TWA. All audiometric tests will be administered by Speech Pathology and Audiology. The audiologist, otolaryngologist or physician will be responsible for all technicians who perform audiometric tests. Audiometric measuring instruments used for audiometric evaluations shall meet the requirement of 29 CFR 1910.95 Appendix (h) (1-5).

Audiometric evaluations will be performed when:

- persons are hired for work in high noise areas.
- prior to initial assignment in high noise areas.
• annually if an employee works in an area identified as area high noise area, (Appendix II)
• upon reassignment to a job in an identified high noise area.
• or at the time of termination of employment.
**Baseline Audiograms**

Baseline audiograms shall be obtained within six months for new hires in groups identified in Appendix III and prior to working in high noise areas. Baseline audiogram results shall be compared to future, annual audiograms to identify hearing loss which may be work related.

Employees being tested for baseline audiograms will not be exposed to noise (greater than 70 dBA) for fourteen hours prior to the test. If the noise level cannot be assured then adequate hearing protection devices can be used to substitute for the fourteen hour noise exposure requirement.

**Annual Audiograms**

Annual follow-up audiograms will be taken after a valid baseline has been established for those who have been included in the hearing conservation program.

**Audiogram Evaluations**

Baselines audiograms shall be compared to annual and follow-up audiograms to identify employees who may be experiencing noise aggravated, work related, standard threshold shifts. Once a standard threshold shift has been identified, that person shall be re-tested within thirty days. The results from the re-test shall be substituted as the annual audiogram results. When an audiogram indicates a Standard Threshold Shift (STS) the employee shall be notified in writing, within twenty-one days of the determination, by the supervising audiologist. A copy of the notice will also be forwarded to the Hearing Conservation Program Manager in Environmental Health and Safety Office.

Audiograms that suggest an STS is persistent or indicates that the annual audiogram threshold has improved over the baseline can be revised as a new baseline. Baseline revisions shall be under the discretion of the supervising audiologist.

Audiograms suggesting there is an attenuation problem will be reviewed by the supervising audiologist. The need for further audiometric evaluations for suspect audiograms will be left to the discretion of the supervising audiologist.

Employees determined to have experienced an STS shall be provided hearing attenuation which can sufficiently reduce work-place noise exposure to an 8-hour time weighted average of 85 dBA or less.
Determination of Workplace Noise Induced Significant Threshold Shifts

Significant Threshold Shifts shall be identified by comparing annual audiograms. The most recent audiogram will be adjusted to compensate for the contribution aging has on the shift in hearing levels. Significant Threshold Shifts shall be determined by comparing previous audiograms to current. A shift in hearing threshold, outside the range of audiometric testing variability (5 dB), warrants follow up action to prevent further hearing loss. NIOSH defines Significant Threshold Shift as an increase of HTL of 10 dB or more at any frequency (500, 1000, 2000, 3000, 4000, or 6000 Hz) in either ear that is confirmed for the same ear and frequency by a second test within 30 days.

Section 6.0 Hearing Protection

It will be the responsibility of the departments included in the HCP to provide hearing protection for their employees. Department supervisors will be responsible for insuring that hearing protectors are worn. The use of hearing protection will be mandatory when:

- noise exposure meets or exceeds an 8-hour TWA of 85 dBA or greater (and who)
- has not yet had a baseline Audiogram within the first six months of employment and employee is assigned to work in a high noise area.
- or has experienced an STS.

Evaluations for the determination of hearing protection and its corresponding attenuation will be in accordance with 29 CFR 1910.95 Appendix B. Hearing protectors must attenuate noise to at least 85 dB. If an STS has been identified, the hearing protectors used must be effective enough to attenuate sound levels to 80 dB. Hearing protection chosen by individuals must attenuate noise exposure to a minimum of 80 dBA as an 8-hour TWA. A re-evaluation of the adequacy of hearing protection attenuation will be performed when there is a change in process that increases the overall noise normally produced.

Section 7.0 Education and Training

All employees will participate in annual training and education as related to the hearing conservation program. Departments will coordinate annual training and education with EHS. Annual training shall be modified whenever there is a change in work processes or in equipment. Training will include:

- The effects of noise on the inner ear and its relation to hearing loss.
- The advantages, disadvantages, and attenuation of various types of hearing protectors.
- Instructions on the use, fitting and care of hearing protectors.
- An explanation of procedures in audiometric testing and the purpose of the testing as it relates to the identification of noise induced hearing loss.
Section 8.0 Record Keeping

It shall be the responsibility of department supervisors to maintain up-to-date records of audiogram results. Supervisors will also be responsible for scheduling follow-up and annual audiograms for their employees. Results from the audiometric tests shall be retained for two years or until the effected employee has left the university. In the event that an employee finds employment outside of the university, his/her records will be made available to the successor employer. Furthermore, all records shall be made available upon request of former employees, current employees, or representatives appointed by employees.

Audiometric evaluations records will include:
- Name and job classification of employee
- Date of the audiogram
- Date the audiometer was last calibrated
- The employees most recent noise exposure assessment
- The examiners name

Please allow a 24 hour processing time when requesting records.

Section 9.0 Responsibilities

Employees

- Assist EHS staff performing exposure monitoring by sharing their knowledge involving the machinery in operation, and job specifics of their environment.

- Notify supervisors of equipment changes or equipment wear that result in an increase in sound level.

- Assist the audiologist by disclosing relevant details of noise exposure histories as well as current ear conditions (ringing in the ear, etc.), or histories of ear disease.

- Know how to use, care for, and select adequate hearing protectors.

Department Directors

- Evaluate the impact modifying equipment and processes will have on overall noise levels.
- Provide break and lunch areas which reduce workplace noise to levels as low as reasonably possible.

- Provide employees time before or after their work shifts to undergo audiometric evaluations.
• Provide employees a selection of hearing protectors and ensure they are worn.

• Promote the use of hearing protection.

• Maintain up to date records of baseline and annual audiogram results.

• Schedule baseline and annual audiograms for employees.

**Facilities Services Safety Officer**

• Post signs to identify noise hazard areas.
• Help coordinate annual training.
• Help coordinate baseline and follow up audiograms.
## APPENDICES

### APPENDIX I

Reference Duration for A-Weighted Sound Levels

<table>
<thead>
<tr>
<th>A-weighted sound level, L (dB)</th>
<th>Reference Duration T, (hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>32</td>
</tr>
<tr>
<td>81</td>
<td>27.9</td>
</tr>
<tr>
<td>82</td>
<td>24.3</td>
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<td>83</td>
<td>21.1</td>
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<td>84</td>
<td>18.4</td>
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<td><strong>85</strong></td>
<td><strong>16</strong></td>
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</tr>
<tr>
<td>130</td>
<td>0.031</td>
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</tbody>
</table>
APPENDIX II

Locations that Produce Noise Levels at or above 85dBA. Areas which are pending will be presumed to exceed 85 dBA until survey is conducted.

<table>
<thead>
<tr>
<th>Location</th>
<th>Date/Time</th>
<th>Sound Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bone Student Center Basement</td>
<td>10/21/08, 1:05pm</td>
<td>87dB</td>
</tr>
<tr>
<td>Centennial East- ME Room 10B</td>
<td>10/20/08, 08:45am</td>
<td>78dB</td>
</tr>
<tr>
<td>Centennial West-ME Room 1</td>
<td>10/20/08, 08:38am</td>
<td>74dB</td>
</tr>
<tr>
<td>Center for Visual Arts-Penthouse</td>
<td>10/22/08, 09:15am</td>
<td>74dB</td>
</tr>
<tr>
<td>Center for Visual Arts ME Room 210</td>
<td>10/20/08, 08:59am</td>
<td>74dB</td>
</tr>
<tr>
<td>Central Chiller (Offline)</td>
<td>10/21/08, 1:15pm</td>
<td>Pending</td>
</tr>
<tr>
<td>College of Business (Elec Vault)</td>
<td>05/01/07</td>
<td>87dB</td>
</tr>
<tr>
<td>DeGarmo Penthouse</td>
<td>10/21/08, 1:40pm</td>
<td>91dB</td>
</tr>
<tr>
<td>Fairchild Basement</td>
<td>10/21/08, 12:53pm</td>
<td>87dB</td>
</tr>
<tr>
<td>Hovey Annex- Basement</td>
<td>10/20/08, 09:35am</td>
<td>81dB</td>
</tr>
<tr>
<td>John Green Basement</td>
<td>10/20/08, 12:35pm</td>
<td>90dB</td>
</tr>
<tr>
<td>John Green above Bakery</td>
<td>10/20/08, 12:40pm</td>
<td>87dB</td>
</tr>
<tr>
<td>Julian Parking Lot</td>
<td>10/23/08</td>
<td>Pending</td>
</tr>
<tr>
<td>Linkins Sub Basement</td>
<td>10/20/08, 12:50pm</td>
<td>92dB</td>
</tr>
<tr>
<td>Linkins Chiller Towers</td>
<td>10/20/08 12:55pm</td>
<td>Offline</td>
</tr>
<tr>
<td>Nelson Smith Basement</td>
<td>10/21/08, 1:00pm</td>
<td>90dB</td>
</tr>
<tr>
<td>Northwest Chiller Building</td>
<td>10/20/08, 08:30am</td>
<td>Pending</td>
</tr>
<tr>
<td>Schroeder-1st floor, ME Rm 111B</td>
<td>10/21/08, 1:15pm</td>
<td>77dB</td>
</tr>
<tr>
<td>Schroeder Annex, Basement ME</td>
<td>10/21/08, 1:25pm</td>
<td>73dB</td>
</tr>
<tr>
<td>Southeast Chiller Building</td>
<td>08/07/08, 1:00pm</td>
<td>88.3dB</td>
</tr>
<tr>
<td>Stevenson Basement</td>
<td>10/23/08</td>
<td>Pending</td>
</tr>
<tr>
<td>Turner Basement</td>
<td>10/20/08, 1:14pm</td>
<td>84dB</td>
</tr>
<tr>
<td>U-High ME Room 116A</td>
<td>10/20/08, 12:20pm</td>
<td>84dB</td>
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<tr>
<td>U-High ME Room 120</td>
<td>10/20/08, 12:15pm</td>
<td>80dB</td>
</tr>
<tr>
<td>Vrooman Basement</td>
<td>10/23/08</td>
<td>Pending</td>
</tr>
<tr>
<td>Watterson Basement</td>
<td>10/20/08, 09:15am</td>
<td>80dB</td>
</tr>
<tr>
<td>Williams Penthouse</td>
<td>10/22/08, 08:59am</td>
<td>Offline</td>
</tr>
</tbody>
</table>
APPENDIX III

Occupations included in Hearing Conservation Program.

Heating Plant and Refrigeration Personnel
Grounds Personnel