Department of

Environmental Safety, Sustainability and Risk

DIVISION OF ADMINISTRATIVE AFFAIRS

HEARING CONSERVATION PROGRAM

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Policy Statement

I. Purpose.

This is a statement of official University policy to establish the process for compliance with the Occupational Safety and Health Administration (OSHA) regulation, "Occupational Noise Exposure Standard" (29 CFR 1910.95).

II. Policy.

It is the policy of the University of Maryland (UMD) to provide employees with a safe and healthful working environment. This is optimally accomplished by incorporating feasible safeguards into facilities and equipment designs. When effective engineering controls are not feasible, or when they are being initiated, administrative controls and/or personal protective equipment will be utilized to prevent employee exposure to noise over regulated or recommended levels.

UMD adopts the American Conference of Governmental Industrial Hygienists (ACGIH) noise exposure limits referred to as Threshold Limit Values (TLVs). The UMD *Hearing Conservation Program* shall be implemented for all UMD employees whose noise exposures meet or exceed the ACGIH criteria.

The UMD *Hearing Conservation Program* shall be reviewed and evaluated for its effectiveness at least annually, and updated as necessary.

III. Responsibilities.

A. Department of Environmental Safety, Sustainability and Risk (ESSR) shall:

1. Develop, implement and administer the UMD *Hearing Conservation Program*,
2. Provide the technical expertise and equipment necessary to identify work areas and equipment within UMD facilities where noise levels equal or exceed 85 dBA,
3. Provide the technical expertise and equipment necessary to identify, through personnel monitoring, UMD employees whose noise exposure levels equal or exceed an 8-hour Time-Weighted Average (TWA) of 85 dBA,
4. Periodically re-monitor identified at-risk employees,
5. Resurvey work areas and equipment when notified that noise levels may have changed due to facility or equipment modifications,
6. Identify potential high noise areas or equipment during routine building activities and measure sound levels to determine need for additional monitoring or protective equipment,
7. Determine appropriate type(s) of hearing-protective devices necessary to protect employees' hearing,
8. Train employees on mandatory elements of the UMD *Hearing Conservation Program*,
9. Provide recommendations concerning noise control measures including engineering controls and administrative controls,

10. Install signs on doors to areas containing equipment consistently generating noise levels in excess of 85 dBA, and
11. Maintain records of noise measurements and employee training.

B. Supervisors shall:
1. Identify to ESSR Occupational Safety & Health Unit, equipment and locations where high noise levels are suspected,
2. Identify to ESSR Occupational Safety & Health Unit all employees who are suspected to have high noise exposures,
3. Ensure all employees with documented high noise exposures enroll in the medical surveillance program for noise,
4. Schedule employees subject to the requirements of the UMD *Hearing Conservation Program* for audiometric testing with the Dept. of Hearing and Speech Sciences,
5. Ensure affected employee participation in annual hearing conservation training,
6. Monitor and enforce the use of hearing protective devices when required,
7. Implement administrative controls and enforce the use of appropriate engineering controls when applicable, and
8. Contact ESSR Occupational Safety & Health Unit when new procedures are implemented or new equipment is utilized that may affect an employee's noise exposure.

C. Departments with Employees Exposed to TWA Noise Exposures at or Over 85 dBA shall:
1. Provide facilities and engineering controls where feasible to reduce employee TWA noise exposure below 85 dBA.

D. Facilities Management – Capital Projects shall:
1. Evaluate construction plans for installation of equipment capable of generating high noise levels, and
2. Notify ESSR Occupational Safety & Health Unit of new facilities containing equipment suspected of producing high noise levels.

E. Employees Exposed to TWA Noise Exposures at or Over 85 dBA shall:
1. Wear and maintain hearing protective devices as instructed,
2. Participate in annual training,
3. Participate in annual audiometric testing,
4. Use only those brands/types of hearing protection devices which are appropriate for the noise exposure, and for which the employees have been trained and fitted, and
5. Report to their supervisor any changing conditions that may impact employee noise exposures.

F. Employees with Periodic Exposure to High Noise and Whose TWA Noise Levels are below 85 dBA shall:
1. Wear and maintain hearing protective devices as instructed,
2. Participate in initial training, and

3. Report to their supervisor any changing conditions that may impact personal noise exposures.

G. Department of Hearing and Speech Sciences shall:
   1. Provide an audiometric testing program for affected employees that meets the requirements specified by OSHA,
   2. Provide information to employees, as requested, concerning the methods and requirements for audiometric testing, and
   3. Report results of audiometric testing to the University Health Center.

H. The University Health Center - Occupational Health shall:
   1. Interpret results of audiometric testing,
   2. Report results of audiometric testing to employees,
   3. Report hearing deficiencies (standard threshold shifts) to supervisors, ESSR Occupational Safety & Health Unit and the employee for follow-up testing, examinations and/or recommendations as appropriate,
   4. Notify supervisors of affected employees that they must schedule audiometric testing with the Dept. of Hearing and Speech Sciences,
   5. Maintain all employee medical records pertaining to the UMD *Hearing Conservation Program*,
   6. Provide information to employees, as requested, concerning the effects of noise on hearing and interpretation of audiometric testing, and
   7. Coordinate evaluation of employees reporting discomfort associated with their use of hearing protection.

IV. Information

Assistance will be provided by the Department of Environmental Safety, Sustainability and Risk (ESSR) to any Department requesting guidance or training to satisfy implementation of this policy.

Departments or units with employees whose TWA noise exposures do not meet or exceed 85 dBA may request hearing conservation services if desired. Such services may include training from ESSR, audiometric testing through the Dept. of Hearing and Speech Sciences and audiometry interpretation from the University Health Center.

Definitions and Acronyms

Action Level: An 8-hour time-weighted average of 85 decibels A-weighted (85 dBA 8-hr TWA) established by OSHA.

Administrative Controls: Methods that limit an employee's exposure time to noise. This includes assigning the employee to less noisy areas in the workplace for a certain length of time so the employee shall not exceed the action level.

Audiogram Testing: Exams that measure the sensitivity of a person's hearing threshold in decibels as a function of frequency.

Audiometer: An instrument for measuring the threshold or sensitivity of hearing.

Audiologist: 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.

Baseline Audiogram: An audiogram obtained after 14 hours of quiet. The audiogram against which future audiograms are compared.

Continuous Noise: Noise levels that vary with intervals of one second or less.

Decibels (dB): A measure of the sound level (loudness). The decibel scale is a logarithmic scale; as an example, a 90 dB noise is ten times louder than a 80 dB noise.

Decibels, A-Weighted (dBA): The A weighted is the scale used for most occupational noise measurements. The A weighting approximates the range of human hearing by reducing the effects of lower and higher frequency noises with respect to the medium frequencies.

Decibels, C-Weighted (dBC): The C weighted scale filters include both high and low frequency noise and are used for impact noise and in the selection of hearing protection.

Engineering Controls: May include purchasing quieter equipment using barriers, damping, isolating, muffling, installing noise adsorption material, mechanical isolation, variations in force, pressure or driving speed or any combination of methods to decrease noise levels.

Hearing Conservation Program (HCP): Program established when employees are exposed to noise exceeding the Action Level. Program must include noise surveys, audiometric testing, hearing protectors, training, and recordkeeping requirements.

Hearing Protection Devices (HPD's): Personal protective equipment that is designed to be worn in the ear canal or over the ear to reduce the sound level reaching the ear drum. Examples include ear muffs or plugs.

Hearing Threshold Level (HTL): The lowest threshold that the employee can hear the test tone during an audiometric test. The HTL's are recorded on the employee's audiogram.

Hertz (Hz): A unit of measurement of frequency, expressed as cycles per second.

Impulse/Impact Noise: Noise that is a sharp burst of sound, generally less than one-half second in duration, that does not repeat itself more than once per second.

Noise: Unwanted sound.

Noise Dosimeter: An instrument worn by an individual that integrates the sound level exposure over a period of time.

Noise Reduction Rating (NRR): The Noise Reduction Rating of hearing protection devices (HPD) indicates the theoretical amount of reduction of noise levels that can be achieved if the HPD is worn correctly. This rating is shown on the HPD packaging.

Otolaryngologist: A physician specializing in diagnosis and treatment of disorders of the ear, nose and throat.

Permissible Exposure Limit (PEL): 90 dBA 8-hr TWA.

Pitch: Another term for sound frequency. Higher pitches are higher frequency sounds.

Representative Exposure: Measurements of an employee's noise dose or 8-hour time weighted average sound level that is representative of the exposures of other employees in the workplace.

Sound: A vibration or pressure oscillation that is detectable by the ear drum.

Sound Level Meter : An instrument used for the measurement of noise in sound level surveys.

Speech Interference Levels (SILs): The frequencies most associated with speech, which are the 500-4000 hz (frequency) range. Vowels (a, e, i, o, u) are low frequency sounds (below 2000 hz) and consonants (b, c, d, etc) are high frequency sounds. The low frequencies are the least affected by noise. If the high frequencies are affected, t's and p's or s's and f's may be easily confused.

Standard Threshold Shift (STS): An average shift from the baseline measurement in either ear of 10 dB or more at 2000, 3000 and 4000 Hz. These frequencies are the most important frequencies in communication and the most sensitive to damage by industrial noise exposure.

Time-Weighted Average Sound Level (8-hr TWA): That sound level, which if constant over an 8-hour exposure, would result in the same noise dose measured in an environment where noise level varies.

Threshold of Pain: A noise level of 120 dB causes pain.

Program Requirements

Evidence is well established that worker exposure to noise of sufficient intensity and duration can result in permanent hearing damage. Noise-induced hearing loss rarely results from a single exposure; it can progress unnoticed over a period of years. Early noise-induced hearing loss occurs at the higher frequencies where the consonant portion of speech occurs, making communication difficult.

The Occupational Safety & Health Administration (OSHA) requires employers to:

A. Monitor facilities and employees to determine noise overexposure situations,
B. Develop and implement a written *Hearing Conservation Program* that identifies the methods used to comply with regulatory requirements,
C. Implement an audiometric testing program for employees with high noise exposures to determine if exposure impacts hearing ability,
D. Provide appropriate hearing protection to employees with high noise exposures if other methods of noise control are not feasible or during installation of such controls,
E. Provide annual training for employees with high noise exposures, and
F. Maintain medical and monitoring records pertaining to the *Hearing Conservation Program*.

To meet these requirements, the University of Maryland has established this *Hearing Conservation Program*. Program elements are described below.

Monitoring

In order to effectively control exposure to high levels of noise it is necessary that the noise be accurately measured according to standard procedures, and that the measurements be properly evaluated against accepted criteria.

The monitoring of employees for noise exposure is made up of two parts, area and personal monitoring. Area measurements are generally obtained first. If noise levels approach or are above prescribed levels, personal monitoring using dosimeters is then performed.

Area Measurements:

In an area survey, measurements of noise levels are documented using a sound level meter to identify work areas where employees' exposures may be above hazardous levels requiring more thorough exposure monitoring. Area monitoring is conducted using a calibrated sound level meter set to the A-weighted scale, slow response. Within the area of interest, several different locations are typically measured. Measurement locations might include:

- In the hearing zone at the employee's normal work location
- Next to the noise source(s)
- At the entrance(s) to the work area
- At other locations within the area where the employee might work

If noise levels are below 80 dBA in the area, no further routine monitoring will be required for that area. Should any of the noise measurements equal or exceed 85 dBA, records shall be maintained as to the noise levels recorded, where they were taken, and the source(s) of the noise. These records shall be updated periodically to determine if any changes have occurred that would warrant remonitoring of exposed personnel. If any of the measurements approach

or exceed a noise level of 85 dBA, employees who work in or near the high noise area or equipment shall have their noise exposure determined through personnel monitoring using dosimeters.

Personal Monitoring:

Determination of personal noise exposures will be accomplished using calibrated noise dosimeters. Employees monitored will have dosimeters placed on them at the beginning of their normal work shift with the microphone attached in the "hearing zone". The dosimeter will be worn for the full duration of the work shift while the employee performs a normal work routine. At the end of the work shift, the dosimeter will be removed and information analyzed as soon as possible. Background information will be collected from each employee detailing job description, unusual job activities, etc., for the sample period. Those departments who have one or more employee whose noise exposures is equal to or exceed 85 dBA as an 8-hour timeweighted average (TWA) will be identified to supervisors. All employees will be enrolled into the Hearing Conservation Medical Surveillance Program.

Re-monitoring of Hazardous Noise Areas:

All areas where noise levels approach or exceed 85 dBA shall be re-monitored periodically. Representative employees who work in high noise areas and whose 8-hour TWA approaches or exceeds 85 dBA will be monitored periodically to determine personal noise exposure for all similar employees.

Whenever an employee exhibits a standard threshold shift, as determined by the University Health Center - Occupational Health Unit (UHC – Occupational Health), remonitoring will be conducted to attempt identification and correction of the cause.

Re-monitoring Due to Changes:

Any area with noise levels that approach or exceed 85 dBA shall also be remonitored whenever a change in production process, equipment, or controls increases the noise exposure such that additional employees are exposed to noise levels at or above 85 dBA on a time-weighted average basis. Areas where the noise levels have dropped below 80 dBA due to alterations in equipment, controls or process changes shall be eliminated from the monitoring program.

ESSR Occupational Safety & Health Unit shall provide copies of personal exposure monitoring results to all monitored employees and to the UHC – Occupational Health. Supervisors will be provided a report that summarizes monitoring in areas under their control. ESSR Occupational Safety & Health Unit shall permit affected employees or their representatives an opportunity to observe any noise measurements conducted.

Medical Surveillance/Audiometric Testing

Upon identification of employees whose 8-hour TWA equals or exceeds 85 dBA, the supervisor shall contact UHC – Occupational Health to enroll these employees in the UMD Hearing Conservation Medical Surveillance Program. Information supplied to the UHC – Occupational Health will include the employee’s name, supervisor's name, work telephone number(s) and the noise levels recorded in the employee's work area. Copies of dosimetry data will be forwarded to the UHC – Occupational Health by ESSR Occupational Safety & Health Unit. It is the responsibility of supervisors to enroll their employees in the UMD Hearing Conservation Medical Surveillance Program.

Affected departments are responsible for costs associated with the UMD Hearing Conservation Medical Surveillance Program. A fee will be charged for audiometric testing and interpretation of the results. A fee will also be charged to departments for employees who fail to attend scheduled audiometric testing and who fail to provide at least 24 hours notice to the Dept. of Hearing and Speech Sciences.

In work locations where either through administrative or engineering controls, noise levels decrease such that the employees' 8-hour TWAs are below 85 dBA, ESSR Occupational Safety & Health Unit shall notify the UHC – Occupational Health and the employees' Supervisors, by memo, that the employees working in that area are no longer required to be enrolled in the UMD *Hearing Conservation Program*.

The UHC – Occupational Health will contact supervisors when audiometric testing is due. The supervisor is responsible for scheduling employee audiometric testing with the Dept. of Hearing and Speech Sciences. Employees with exposure to TWA noise levels of 85 dBA or greater must have baseline audiometric testing performed within 6 months of initial noise exposure. Thereafter, audiometric testing must be performed at least annually until separation from employment or upon transfer to duties with noise exposures below 85 dBA.

The Dept. of Hearing and Speech Sciences has the responsibility for administering the Audiometric Testing Program portion of the UMD *Hearing Conservation Program*. The object of the audiometric testing program is to identify workers beginning to experience hearing loss to allow intervention before the hearing loss progresses. Audiometric testing will be provided to all employees with exposure to TWA noise levels of 85 dBA or greater. Annual retesting will be performed for all personnel enrolled in the UMD Hearing Conservation Medical Surveillance Program.

> **Baseline audiogram.** The baseline audiogram is the reference audiogram against which future audiograms are compared. Supervisors shall ensure new employees receive the baseline audiograms within 6 months of an employee's first exposure at or above an 8-hour TWA of 85 dB. Employees should not be exposed to workplace noise for 14 hours before the baseline test or wear hearing protectors during this time period.
>
> **Annual audiograms.** Supervisors should ensure employees receive follow-up audiograms within 1 year of the baseline. It is important to test workers' hearing annually to identify deterioration in their hearing ability as early as possible. This enables supervisors to initiate protective followup measures before hearing loss progresses. The UHC – Occupational Health unit will compare annual audiograms to baseline audiograms to determine whether the audiogram is valid and whether the employee has lost hearing ability or experienced a standard threshold shift (STS). An STS is an average shift in either ear of 10 dB or more at 2,000, 3,000, and 4,000 hertz.

Audiometric testing not only monitors the sharpness or acuity of an employee's hearing over time, but also provides an opportunity for employers to educate employees about their hearing and the need to protect it. The important elements of the audiometric testing program include baseline audiograms, annual audiograms, training, and follow-up procedures. Audiometric testing must be made available at no cost to employees exposed to TWA noise levels of 85 dBA or greater.

If the annual audiogram shows that an employee has experienced a standard threshold shift (STS), the UHC – Occupational Health will arrange for the employee to retest within 30 days, and the results of the retest will be used as the annual audiogram. If a STS is indicated, the employee shall be informed of this fact in writing within 21 days of the determination. If a UHC – Occupational Health physician determines the STS may be work-related or aggravated by occupational noise exposure, the employee will be referred for a follow-up clinical audiological evaluation. The employee's supervisor will also be notified of the STS and shall ensure that the employee has appropriate hearing protection, is trained in their use and care, and required to use them. Employees already using hearing protection shall be refitted (if necessary) and retrained in the use of hearing protection and provided hearing protection offering greater attenuation if necessary.

Hearing Protection

The University of Maryland shall make hearing protection available at no cost to all employees who are exposed to TWA noise levels of 85 dBA or greater. Hearing protection will also be provided to employees with routine periodic noise exposures over 85 dBA.

Hearing protection shall be replaced as necessary. Employees shall be given an opportunity to select their hearing protection from a variety of suitable devices. ESSR Occupational Safety & Health Unit shall provide training in the use and care of all hearing protection devices provided to employees. The supervisor shall monitor the correct use of all hearing protection.

ESSR shall determine hearing protection attenuation necessary for the specific noise environments in which the hearing protection will be used. Hearing protection must attenuate (lower) employee exposure at the ear to no more than a TWA noise level of 85 dBA. The adequacy of hearing protection shall be reevaluated whenever employee noise exposures increase to the extent that the hearing protection may no longer provide adequate attenuation.

Employees whose 8-hour TWA noise exposures do not meet or exceed 85 dBA will be provided hearing protection if their duties require entry into noise hazard areas with sound levels measured over 85 dBA. Noise hazard areas that are not designed for extended work operations (e.g., mechanical rooms) will be placarded with signage advising entrants of the maximum noise levels measured in these spaces. Entrants are strongly encouraged to utilize hearing protection when entering these spaces.

Any personnel experiencing difficulty in wearing assigned hearing protection (i.e., irritation of the canals, pain) will be advised during training to immediately report this to their supervisor to schedule an appointment with the UHC – Occupational Health for evaluation as soon as possible.

Training

When workers understand the reasons for the UMD *Hearing Conservation Program* requirements and the need to protect their hearing, they will be better motivated to participate actively in the program and to cooperate by wearing their hearing protection and taking audiometric tests. ESSR Occupational Safety & Health Unit will annually train employees exposed to 8-hour TWA noise exposures of 85 dB and above concerning:

1. The UMD *Hearing Conservation Program*,
2. The effects of noise,
3. The purpose, advantages, and disadvantages of various types of hearing protection,

4. The selection, fit and care of hearing protection,
5. The purpose and procedures of audiometric testing, and
6. Noise hazard areas.

Training will be documented electronically and by sign-in training sheets by ESSR Occupational Safety & Health Unit at the time of training.

Workers who have exposures to noise at or above 85 dBA, but whose 8-hour TWAs do not meet or exceed this limit will be provided initial training concerning:

1. The UMD *Hearing Conservation Program*,
2. The appropriate use of hearing protection,
3. The effects of noise exposure, and
4. Noise hazard areas.

This training may be provided by ESSR Occupational Safety & Health Unit or supervisory personnel knowledgeable of the requirements of the UMD *Hearing Conservation Program*.

Reckordkeeping

Noise exposure measurement records must be kept for 2 years. Audiometric test records must include the name and job classification of the employee, the date, the examiner's name, the date of the last acoustic or exhaustive calibration, measurements of the background sound pressure levels in audiometric test rooms, and the employee's most recent noise exposure measurement.

ESSR Occupational Safety & Health Unit shall maintain an accurate record of all employee exposure measurements. The University Health Center - Occupational Health and the Hearing and Dept. of Hearing and Speech shall retain all employee audiometric testing records for the duration of employment. Employee records shall be provided upon request by the employee or designated representative.

Signage

Signs are to be posted at access points to noise hazard areas to inform employees of the need or recommendation for use of hearing protection. Two types of signage will be utilized:

1. Locations where dosimetry measurements indicate employee 8-hour TWA noise exposures meet or exceed 85 dBA will be posted with signage with dimensions of at least 10" X 14" identifying the space as a noise hazard designating the use of appropriate hearing protection. Signs should textually or graphically include:

Warning
Noise Area
Hearing Hazard
Use of Hearing Protectors Required

2. Locations that are infrequently occupied where operating mechanical equipment produces noise levels at or over 85 dBA (e.g., mechanical rooms) will be posted with the following 6" X 4" sign:

Employees entering these spaces are encouraged to utilize hearing protection.

Appendix I

Benefits and Drawbacks of Various Hearing Protective Devices

- Earplugs
  - Pros
    - More comfortable due to the lack of head-band pressure
    - Cooler in hot weather
    - Easier to wear in confined spaces
  - Cons
    - Variable attenuation due to proper fit and insertion practices
    - Unsure fit - easily worked loose from routine motions (chewing & jaw movement)
    - Difficult for communication in intermittent noise environments
      - Tedious to remove and reinsert
      - Hygiene – easy to get dirty
      - Easy to lose
- Earmuffs
  - Pros
    - Comfortable in colder environments
    - More consistent attenuation than earplugs
    - More suitable for communication with intermittent noise
    - Some models are equipped with electronics for communication
    - Not worked loose by repetitive motion such as chewing or jaw movement
  - Cons
    - Headband pressure can be uncomfortable
    - Incompatible with other safety gear; safety glasses, hardhats
    - Not very comfortable in hot weather
      - Perspiration can collect under the ear cup, causing annoying sounds in the ear canal

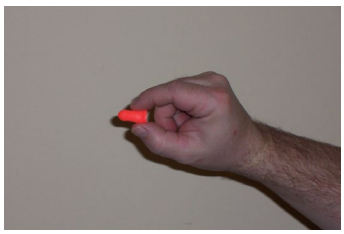
Appendix II

Ear Plug Use Requirements

Earplugs must be properly inserted

(source: http://www.cdc.gov/niosh/mining/topics/hearingloss/earplug.htm)

- **1. Roll** the earplug up into a small, thin "snake" with your fingers. You can use one or both hands.



- **2. Pull** the top of your ear up and back with your opposite hand to straighten out your ear canal. The rolled-up earplug should slide right in.

- **3. Hold** the earplug in with your finger. Count to 20 or 30 out loud while waiting for the plug to expand and fill the ear canal. Your voice will sound muffled when the plug has made a good seal.

Check the fit when you're all done. Most of the foam body of the earplug should be within the ear canal. Try cupping your hands tightly over your ears. If sounds are much more muffled with your hands in place, the earplug may not be sealing properly. Take the earplug out and try again.

Dispose after use. Foam ear plugs may be used during one working shift but must be discarded at the end of the shift.