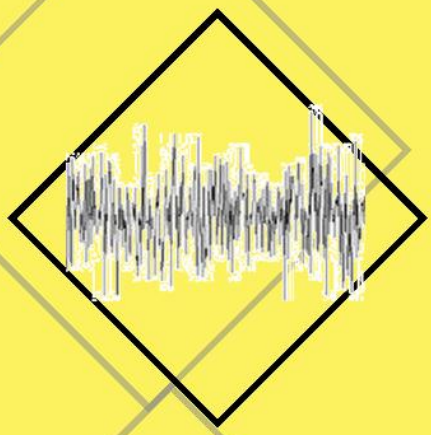
Environmental Health & Safety

OFFICE OF THE VICE PRESIDENT FOR
UNIVERSITY OPERATIONS

Hearing Protection Plan



January 2012

THE UNIVERSITY OF TEXAS AT AUSTIN

WHAT STARTS HERE CHANGES THE WORLD

President's Environmental Health and Safety Statement of Commitment

The University of Texas at Austin is committed to protecting the health and welfare of students, faculty, staff and visitors, as well as the environment. Together we must maintain a healthy and safe campus and foster a culture of safety throughout the university.

Environmental health and safety (EHS) is a shared responsibility. All members of the university should recognize and work to reduce injuries and minimize adverse environmental impacts. It is essential that deans, directors, department heads, and faculty and staff supervisors lead this effort. Employees are to take an active part in their own safety and the safety of those around them. This includes understanding and complying with EHS requirements, reporting all incidents and accidents, completing all required training, and taking personal responsibility for a safe and healthy campus.

With this Statement, I hereby reaffirm my support for the following EHS principles:

- prevent or mitigate human or economic losses arising from accidents, adverse occupational exposures and environmental events;
- build EHS considerations into all phases of operations including facility design and construction, research and teaching;
- achieve and maintain compliance with EHS laws and regulations; and
- continually improve our EHS performance by adopting best practices.

This commitment also recognizes and promises to respond to legitimate community concerns about EHS and to provide appropriate and timely information in response to questions about EHS issues.

The EHS office has been charged with developing innovative and responsible programs and procedures to support this commitment including periodic assessments to review performance and track corrective actions. For questions or assistance, contact the EHS office.

William Powers, Jr.
President

Date 9/26/11

Environmental Health & Safety

THE UNIVERSITY OF
TEXAS
AT AUSTIN

WHAT STARTS HERE CHANGES THE WORLD

HEARING PROTECTION PROGRAM OVERVIEW

June 30, 2011

1.0 Purpose and Applicability

1.1 This program is designed to ensure that University personnel who are exposed to high noise levels are adequately protected and receive appropriate training.

1.2 This program applies to all University employees who are required to wear hearing protection due to the nature of their work at the University.

1.3 Hearing protection may be achieved through engineering, administering, or personal protective equipment. Personal protective equipment is defined as ear plugs or muffs specifically designed to prevent hearing damage

2.0 Definitions

2.1 "High noise" is defined as the 8-hour time weighted average (TWA) at or above 85 decibels (dBA) on the A-scale. This definition has been endorsed by other UT Austin departments, is consistent with American Industrial Hygiene Association (AIHA) recommendation, and other major research institutions.

2.2 "Noise Reduction Rating (NRR)" is defined as the estimated attenuation capacity of a hearing protector to represent the approximate noise reduction, in dBA.

3.0 Roles and Responsibilities

3.1 Environmental, Health and Safety (EHS) has overall responsibility for this program including recommending the type of hearing protection required to lower noise level below 85 dBA and provide periodic training.

3.2 Each department and contract company is responsible for purchasing and maintaining their own hearing protection equipment, as recommended by EHS or their departmental Safety Coordinator. The department will be responsible for notifying the Occupational Health Program (OHP) of its employees that are required to be in the hearing protection program as determined by EHS or their departmental Safety Coordinator.

3.3 Occupational Health Program is responsible for implementing and overseeing all audiograms and medical evaluations necessary to protect the hearing of employees.

3.4 Employees are responsible for complying with all appropriate guidance as to when to wear hearing protection, completing any University or department required training, and for scheduling and completing all required medical evaluations associated with high noise areas. Employees who voluntarily wear hearing protection, for noise levels below 85 dBA, are not subject to the requirements in this document.

4.0 Program Elements

4.1 Hearing Protection Assessment

EHS, in conjunction with the Safety Coordinators and affected departments, will determine the need for hearing protection. This will be accomplished by review of job descriptions, task analyses, industrial hygiene sampling, institutional knowledge, or surrogate data from similar departments or industries.

4.2 Engineering Controls for Hearing Protection

Should it be determined that employees or departments are in high noise areas, engineering controls will be investigated first to determine the feasibility of designing out the high noise. Should engineering controls be determined as infeasible, hearing protection, with the adequate NRR to lower noise levels below 85 dBA will be recommended.

4.3 Medical Evaluation

Any and all University employees that work in areas with 8 hour TWA at or above 85 dBA will have a baseline audiogram and every year thereafter that they continue to work in a designated hearing conservation area.

4.3 Training

EHS or Safety Coordinators will provide training on the use, maintenance, and limitations of hearing protection to all University employees who are required to wear hearing protection while performing work for the University. Training will be tracked using the TXClass system.

4.4 Record Keeping

Occupational Health Program, or their designee, will perform the audiograms. OHP will be the repository for all medical evaluations. EHS will use assign a specific TXClass number to track employee training.

5.0 Key References and Resources

- American Industrial Hygiene Association (AIHA) http://www.aiha.org/
- University of Washington http://depts.washington.edu/occnoise/index.html
- Arizona State University http://www.asu.edu/aad/manuals/ehs/ehs110.html
- Iowa State http://www.ehs.iastate.edu/publications/manuals/hearing.pdf
- University of Florida http://www.ehs.ufl.edu/General/hearpol.htm
- OSHA Hearing Conservation (29 CFR 1910.95) http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9735

For questions regarding the University's hearing protection program contact EHS or your department Safety Coordinator.

Dr. Bob Harkins, Associate Vice President-Campus Safety and Security — Date: July 12, 2011

Dr. Pat Clubb, Vice President -University Operations — Date: 7-15-11

Environmental Health & Safety

This Plan was developed by EHS in collaboration with safety professionals from the following departments Utilities and Energy Management, Facilities Services, the Division of Housing and Food Services, and the Occupational Health Program.

Peter Schneider, Director, Environmental Health and Safety

1/25/12
Date

Environmental Health & Safety
THE UNIVERSITY OF TEXAS AT AUSTIN

TABLE OF CONTENTS

ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienist
AIHA	American Industrial Hygiene Association
AL	Action level
ANSI	American National Standards Institute
CDC	Center for Disease Control
dB	Decibel(s)
dBA	Decibel(s), A-weighted
EHS	Environmental Health and Safety Department
HPD	Hearing protection device
ISO	International Standards Organization
NIHL	Noise-induced hearing loss
NIOSH	National Institute for Occupational Safety and Health
NRR	Noise reduction rating
OSHA	Occupational Health and Safety Administration
PEL	Permissible exposure limit
PTS	Permanent threshold shift
REL	Recommended exposure limit
SPL	Sound pressure level
STEL	Short term exposure level
STS	Standard threshold shift
TLV	Threshold limit value
TWA	Time weighted average
UT	The University of Texas at Austin

1.0 INTRODUCTION

1.1 Purpose & Applicability

The University's Hearing Protection Plan (HPP) applies to all The University of Texas at Austin facilities at all locations and to all employees who are required to wear hearing protection due to the nature of their work for the University.

The Plan describes how to implement the required elements of a protection program in order to protect University personnel's hearing and is supported by additional training resources and other guidance.

The purpose of the HPP is to reduce employee risk for hearing loss due to over-exposure to noise in the workplace. This program is designed to ensure that all University employees who are exposed to elevated noise levels are adequately protected and receive appropriate training.

1.2 Objectives

The objectives of the Hearing Protection Plan are:

- To identify employees that have the potential to be exposed to high noise levels.
- Enter employees in medical surveillance program to ensure that hearing protection is adequate.
- To reduce worker exposure to noise by implementing engineering or administrative controls.
- To provide workers with recommendations for personal protective equipment that will reduce noise, below the action level, when engineering or administrative controls are infeasible.
- To train employees working in high noise areas on the effects of high noise exposure on hearing and on the proper use of hearing protection devices.

2.0 EXPOSURE LIMITS

The University exposure limit for noise is 85 dBA for an eight-hour period. Most residential smoke detectors are set at 85 dBA. This exposure limit is accordance with recommendations from AIHA and NIOSH. Table 1 details the University's action levels (ALs) for noise according to duration of exposure. For continuous exposure to noise, please refer to Table 1. Noise levels below 85 dBA averaged over an eight-hour period are not covered by the University exposure limit and therefore are not subject to the details of this plan. Noise levels below 85 dBA do not require hearing protection. Exposure to impact and impulse noise should be limited. The threshold for noise induced hearing loss (NIHL) is 140dB and it should never be exceeded.

Table 1. University Action Levels (ALs) for Noise[1]

Sound level dBA[2] slow response	Duration	
	Hours	Minutes
85	8	--
86	6	--
88	4	--
89	3	--
91	2	--
92	1	30
94	1	
97	--	30
100	--	15
111	--	1

1. When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each.
2. dBA = Decibels (dB) on A scale

3.0 ROLES AND RESPONSIBILITIES

3.1 Environmental Health and Safety (EHS) Department

EHS has overall responsibility for the program including recommending engineering and administrative control measures and/or the type of hearing protection required to lower noise level below 85 dBA. EHS will also provide employee training, as appropriate, may conduct periodic review of program and program elements, and conduct noise assessments.

3.2 Individual Departments and Contractors

Each individual department and contract company is responsible for deciding who will purchase hearing protection. The department will be responsible for notifying the Occupational Health Program, HealthPoint, which of its employees are required to be in the hearing protection program as determined by EHS or their departmental Safety Coordinator. The department is responsible for any costs incurred due to construction or erection of engineering controls. Departments are responsible for purchasing and maintaining of basic hearing protection devices.

3.3 Occupational Health Program (OHP)

HealthPoint is responsible for implementing and overseeing all medical evaluations, including audiometric testing necessary to protect the hearing of employees.

3.4 Supervisors

Supervisors are responsible for ensuring that their employees have the time to complete all required training and medical evaluations during working hours

3.5 Employees

Employees are responsible for complying with all University policies and procedures, completing any University or department required training, and for scheduling and completing all required medical evaluations. They are also responsible for maintaining their personal protective equipment as recommended by EHS or their department Safety Coordinator. Employees who voluntarily wear hearing protection for noise levels below 85 dBA are not subject to the requirements in this document.

4.0 HEARING PROTECTION PLAN ELEMENTS

4.1 Exposure Assessment

In order to determine which employees should be in the Hearing Protection Plan an exposure assessment may be performed. Exposure assessments may be conducted by EHS, Safety Coordinators, or a consultant. An exposure assessment may use data from the similar industries or tasks, area or personnel monitoring, or historical data. The assessment should be conducted in accordance with the procedures detailed in the University HPP. Noise exposure is to be measured without regard to wearing of hearing protection.

a) Initial Monitoring

Initial monitoring shall be conducted in coordination with supervisors to determine high noise areas and tasks associated with these high noise levels. Historical data may be used if records validate both the method and instruments used to collect the data. Monitoring may also be conducted as a result of an audit, process changes, new or modified equipment, or at the request of an employee.

When monitoring use a dosimeter for personnel monitoring or a Sound Pressure Level meter for area monitoring. For personnel monitoring, it is best if the dosimeter is placed on the employee's shoulder or lapel near the ear. Always follow manufacturer's training for each specific model. For area monitoring take several readings at approximate ear height where employees may stand, sit, or work.

Best practices suggest that sound measurements should be made at locations that are near the average normal standing or seated height of human ears in the space: 5'-6" for standing and 4'-0" for seated adults.

b) Periodic Monitoring

Periodic monitoring may be conducted to evaluate the effectiveness of control measures to reduce noise exposure. Periodic monitoring may be conducted as a part of HPP program evaluation. A copy of an example sampling report can be found in Appendix F.

c) Equipment

All equipment used for area or personnel monitoring will be calibrated within manufacturer's specifications to ensure that it is in good working order. Prior to using either an area or personnel dosimeters, calibration should be conducted. This should be done by connecting the dosimeter to a predetermined standard for comparison. After monitoring has occurred the instrument should be compared to the same standard. A deviation of greater than 10% would result in speculative results and re-sampling with an instrument that is within 10% of the standard should occur. Both the pre & post calibrations should be recorded.

d) Reporting of information

Personnel monitoring results should be provided to the employee, their supervisor, a copy to HealthPoint and EHS, if EHS did not conduct the monitoring. The elements included in the report, at a minimum should be: name of employee and area monitored, area monitored if the monitoring did not involve a specific person, date monitoring was conducted, results, who performed the monitoring, and whether the results constituent inclusion in the hearing conservation program, see Appendix G for sample forms.

Personnel monitoring is preferable when feasible. It can be used to represent the exposure for the department or task. If personnel monitoring can't be done area monitoring can be used for exposure assessments.

4.2 Control Measures

To adequately define the noise problem and set a good basis for the control strategy, the following factors should be considered: type of noise, noise levels and temporal pattern, frequency distribution, noise sources (location, power, directivity), noise propagation pathways, through air or through structure, room acoustics (reverberation), and type of work being performed.

a) Purchasing & Maintenance of Equipment

Prior to purchasing potentially noisy equipment new or replacement equipment obtain operational noise levels from the manufacturer. Equipment with lower noise levels should be purchased when possible.

In order to ensure that equipment does not increase in noise levels over time, proper maintenance should be performed on a regular basis. This may include:

- Replacement or adjustment of worn or loose parts;
- Balancing of unbalanced equipment;
- Lubrication of moving parts;
- Use of properly shaped and sharpened cutting tools.

During the maintenance or repair of equipment, when feasible, replace with quieter components. By substitution of materials**,** plastic for metal or the replacement of steel sprockets

in chain drives with sprockets made from flexible polyamide plastics, the overall noise generated by the machine may be reduced.

b) Engineering Controls

Engineering controls are defined as any modification or replacement of equipment, or related physical change at the noise source or along the transmission path that reduces the noise level at the employee's ear. If an assessment reveals that employees are being exposed to noise levels greater than or equal to the action level, engineering controls should be considered first to reduce noise exposure. Engineering controls may include, but are not limited to baffling; relocation of noisy equipment, processes; insulation; sound barriers; and substitution of equipment, materials.

In some instances, the application of a relatively simple engineering noise control solution reduces the noise hazard to the extent that further requirements are not necessary. Examples of inexpensive, effective engineering controls include some of the following:

- Choose low-noise tools and machinery.
- Maintain and lubricate machinery and equipment (e.g., oil bearings).
- Place a barrier between the noise source and employee (e.g., sound walls or curtains).
- Enclose or isolate the noise source

c) Administrative Controls

Administrative controls are changes in the workplace that reduce or eliminate the worker exposure to noise. Examples include:

- Operating noisy machines during shifts when fewer people are exposed.
- Limiting the amount of time a person spends at a noise source.
- Providing quiet areas where workers can gain relief from hazardous noise sources (e.g., construct a sound proof room where workers' hearing can recover – depending upon their individual noise level and duration of exposure, and time spent in the quiet area).
- Restricting worker presence to a suitable distance away from noisy equipment.

Controlling noise exposure through distance is often an effective, yet simple and inexpensive administrative control. This control may be applicable when workers are present but are not actually working with a noise source or equipment. Increasing the distance between the noise source and the worker, reduces their exposure. In open space, for every doubling of the distance between the source of noise and the worker, the noise is decreased by 6 dBA.

If an assessment reveals that employees are being exposed to noise levels greater than the action level for the duration of exposure, exposed employees will automatically be enrolled in the HPP, which requires medical evaluation and training. Administrative controls may be used in conjunction with engineering controls and personal protective equipment (PPE).

d) Personal Protective Equipment (PPE)

If engineering and administrative controls are determined as infeasible, employees will be required to use hearing protection as part of the mandatory personal protective equipment. PPE should reduce the noise exposure below the corresponding action levels. Employees that are

required to wear hearing protection are required to receive training on why and when hearing protection is necessary; how to select the proper device; how to wear them correctly; and how to maintain them. Employees who chose to wear hearing protections in areas that are below 85 dBA are considered voluntary and are not subject to training or medical surveillance. The EHS Department is a resource that is available to help departments select appropriate hearing protection for their employees.

4.3 Hearing Protection Devices

Hearing protection devices (HPDs) are used to reduce the risk of hearing loss as a result of overexposure to noise at work. Engineering and administrative controls are the preferable means for hearing protection; however, when these are not feasible or cannot sufficiently reduce noise to safe and acceptable levels below the action limit, hearing protection should be provided to reduce noise exposure. Types of HPDs are discussed in Tables 2 & 3 of this section.

4.4 Hearing Protection Requirements

If engineering or administrative controls are not feasible or are not able to sufficiently reduce noise to safe levels, then hearing protection is required where noise levels are at or above 85 dBA or the action level for the exposure duration as stated in Table 1. The type of hearing protection necessary will depend on the operation, work conditions, any current health conditions that may impede specific type of PPE, and the noise reduction rating (NRR) required. It is possible that hearing protection may also be needed during non-routine, infrequent tasks.

The NRR indicates the potential of a hearing protector to reduce noise. It 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. The NRR represents the noise reduction potential of the protector under laboratory conditions. There are, however, large differences between the hearing protector capability measured in the laboratory and that found in actual use. To adjust the NRR correctly, first the NRR must be reduced by 7 dB then it must be divided by 2.

For example, an earplug with an NRR of 28 dB would be considered to have noise reduction capability of only 10.5 dB. The NRR is subtracted from the average A-weighted noise level in the worker's environment: 28 dB – 7 dB = 21 dB / 2 = 10.5 dB.

Hearing protection is required for the following:

- When the measured exposure exceeds the action; the action for an eight-hour TWA is 85 dBA. See Table 1 for a more complete list of action levels and corresponding exposure durations.
- When the exposure exceeds the action level and the employee has experienced a standard threshold shift.
- When the exposure exceeds the action level and the employee has not yet had a baseline audiogram.

For employees who have experienced a standard threshold shift, hearing protectors must be selected to reduce employee exposure to an 8-hour TWA of below 85 decibels. The adequacy

of hearing protection may be re-evaluated whenever employee noise exposures increase due to task/process change.

In some cases double hearing protection may be required, wearing both ear plugs and ear muffs. This will not double the wearer's protection. Wearing both ear plugs and ear muffs offers an additional 5 dBA reduction in the noise level.

In the example above adding ear muffs would reduce the noise by 15.5 dBA

28 dB – 7 dB = 21 dB / 2 = 10.5 dB ear plugs plus ear muffs 10.5 + 5 dBA = 15.5 dBA

If noise is recorded at 99 dBA wearing both ear muffs and ear plugs would reduce noise exposure for the employee to 99 – 15.5 dBA = 83.5 dBA which is below the 85 dBA action level.

a) Types of Hearing Protections

The University recommends two primary types of hearing protection: ear plugs and ear muffs. Table 2 and Table 3 detail the advantages and disadvantages of each type of hearing protection.

Table 2. Advantages and Disadvantages of Ear Plugs

Advantages	Disadvantages
Higher noise reduction rating	Requires more time to fit
Small and easily carried	More difficult to insert and remove
Convenient to use with other PPE (hard hat, safety glasses, etc)	Requires good hygiene practices
More comfortable for long-term wear in hot, humid work areas	May irritate the ear canal
Convenient for use in confined work areas	Easily misplaced
	More difficult to see and monitor usage
	Should not wear with ear infection

Table 3. Advantages and Disadvantages of Ear Muffs

Advantages	Disadvantages
Easier to properly use	Less portable and heavier
One size fits most head sizes	More inconvenient for use with other PPE
Easily seen at a distance	More uncomfortable in hot, humid work area
Not easily misplaced or lost	May interfere with the wearing of prescription safety glasses
May be worn with minor ear infections	Hair and coveralls with hoods worn may break seal

4.5 Selection of PPE

Each department is responsible for deciding whether or not hearing protection will be purchased for employees and the selection of that hearing protection. However, EHS will be a resource should a department require assistance in selecting appropriate hearing protection.

Hearing protection selection is based on several factors, including the amount of noise employees are exposed to, the location, and the environment. The best HPD for a worker is one that the employee will consistently and correctly wear and adequately reduces noise exposure below the action level.

The following factors may be determinants of a worker's choice, acceptance, and consistent use of hearing protection:

- Adequate noise reduction
- Convenience and availability
- Comfort
- Ease of fit
- Compatibility with other PPE
- Belief that the protector can be worn correctly
- Belief that the protector will prevent hearing loss
- Belief that it will not impair the worker's ability to hear important sounds

a) Fit, Use, and Care of Hearing Protectors

I. Fitting Hearing Protectors

With respect to fit, follow manufacturers' instructions.

To properly wear plugs, follow the steps below.

1. With clean hands, roll the plug in between thumb and first two fingers.
2. Reach over head and pull top of your ear open to open ear canal.
3. While holding the ear open, quickly push the rolled end of the plug into your ear as far as possible. Keeping finger on plug for **60 seconds**, to allow it to fully expand.

In order to ensure the ear muff forms a tight seal within the ear canal hair and clothing should not come between the ear muff and the skin.

II. Using Hearing Protectors

In order to get the full benefit, hearing protectors must be worn all the time during noisy work.

Reseal HPDs throughout the workday if they become loose or the seal is broken. Damaged or deteriorated HPDs should be repaired or discarded as appropriate. Additionally, workers should consult their supervisor if the HPD becomes uncomfortable or problematic.

III. Caring for Hearing Protectors

The University recommends adhering to manufacturer instructions for maintenance and care of hearing protection. General guidelines for care of hearing protection are listed below:

- Inspect hearing protection prior to each use
- Inspect seals on earmuffs for cracks or deterioration
- Ensure ear plugs and earmuffs are clean
- Wash earmuffs with a mild liquid detergent in warm water, then rinse in clear warm water; ensure that sound-diminishing material inside the ear cushions does not get wet
- Use a soft brush to remove skin oil and dirt that can harden ear muff seals
- Store hearing protectors in a clean dry area to avoid weather deterioration and contact with contaminants

Instructions for proper fit, use, and maintenance of hearing protectors are included in the manufacturer's recommendations for each hearing protector.

4.6 Areas Requiring Hearing Protection

Areas identified as high noise areas as a result of noise surveys, may be marked as "Noise Hazard Area" and/or "Hearing Protection Required". Below is an example of a sign depicting a high noise area.

CAUTION

HEARING PROTECTION MUST
BE WORN IN THIS AREA

Stationary sources, such as a table saw, that are at or above 85 dBA when activated, may be marked with signs such as the one below.

CAUTION

HEARING PROTECTION MUST
BE WORN WHEN THIS
EQUIPMENT IS IN OPERATION

a) High Noise Areas

High noise areas are defined as areas where noise measurements of the 8-hour time weighted average (TWA) were at or above 85 dBA on the A scale and designated by EHS or departments. EHS will keep a master list of high noise areas.

5.0 MEDICAL EVALUATION

5.1 Audiometric Testing

Audiometric testing must be performed by a licensed or certified audiologist, otolaryngologist or other physician, or by a technician (with the qualifications specified at 29 CFR 1910.95(g)(3)). Audiometric testing is intended to monitor an individual's hearing over time in order to provide employers and employees an opportunity to protect the employee's hearing. An audiometric testing program is required for all employees exposed to noise levels at or above 85 dBA-TWA. The program consists of an initial baseline audiogram within six months of employee's first exposure at or above the action level, followed by annual audiograms which are compared to the baseline results. Baseline audiometric testing must be preceded by at least 14 hours of no workplace exposure to high noise levels. If necessary, hearing protection may be used during this time to ensure no exposure.

If mobile test vans are used for audiometric testing, the baseline assessment must be conducted within one year of exposure. If the baseline audiogram is conducted after six months, hearing protection must be used after the six month period until the baseline audiometric testing is conducted.

Audiometric test frequencies must include, as a minimum, 500, 1000, 2000, 3000, 4000, and 6000 Hertz (HZ); and are to be taken separately for each ear. If an annual audiogram shows that an employee has suffered a standard threshold shift (STS), a retest may be taken in 30 days, with the retest results considered as the annual audiogram. A STS is a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 HZ in either ear.

Employees are to be notified, in writing, of the results of exams. When there is a STS, the employee must be notified within 21 days after verification. In determining whether an STS has occurred, allowances for aging (presbycusis) may be made and the annual audiogram may be corrected accordingly following the procedures in 29 CFR 1910.95.

The audiologist, otolaryngologist, or physician must review problematic audiograms and determine whether further evaluation is necessary.

If a work-related STS has occurred, employees not already using hearing protection will be fitted with hearing protectors and trained in their proper use and care. Employees already using hearing protectors will be provided hearing protectors that offer greater attenuation if necessary.

5.2 Effects of Noise

Health effects of noise can be divided into two categories: chronic and acute. Chronic effects of noise are health conditions that require long term or continuous treatment such as tinnitus and permanent hearing loss. Tinnitus is characterized by the perception of sound, usually a ringing or buzzing sound, without the presence of an actual noise source. It is sometimes referred to as "ringing in the ears". Permanent hearing loss is irreversible. Although hearing aids can amplify sounds, hearing aids are not able to lower a person's hearing threshold to the original level. Thus, a person diagnosed with permanent threshold shift (PTS) has a decreased hearing perception range that is irreversible.

Acute health effects associated with overexposure to noise could be acoustic trauma and short term hearing loss. Short term hearing loss is reversible, however, the amount of time required to recover hearing varies as does the degree of lost hearing perception. Acoustic trauma is likely to occur from impulsive or impact noise, which is noise that occurs in loud short bursts lasting less than one second and the effects are likely permanent.

Communication issues as a result of hearing impairment may lead to otherwise avoidable safety hazards. For instance, employees that suffer from hearing loss may not be able to hear alarms, radios or other forms of hazard communication, which could increase the risk for an accident.

6.0 TRAINING

6.1 Training Requirements

All employees that are enrolled in the HPP will receive training at a minimum of every three years. There may be an annual information sheet available to employees during their audiogram. The departmental supervisor or Safety Coordinator will notify employees whom are required to receive training. The HPP training will be online, recorded, and available through the TXClass system. Departments are welcome to have additional site specific training.

7.0 RECORDKEEPING

7.1 General Records

EHS should be provided with copies of all noise monitoring.

7.2 Medical Evaluations

HealthPoint, or their designee, will perform all medical evaluations. HealthPoint will be the repository for all medical evaluations. Medical records will be kept for duration of employment plus thirty years.

8.0 PROGRAM EVALUATION

8.1 HPP Compliance Audits

EHS will conduct a program review every twelve to twenty four months. This may be completed by a contractor. The review may include, spot inspections, re-sampling of noise data, and audit of training records**.**

9.0 REVISIONS

Comment	Date
[Reserved]	
[Reserved]	
[Reserved]	
[Reserved]	
[Reserved]	
[Reserved]	
[Reserved]	
[Reserved]	
[Reserved]	
[Reserved]	
[Reserved]	
[Reserved]	
[Reserved]	

APPENDIX A

GLOSSARY

GLOSSARY

Acoustic Trauma: An injury to the hearing mechanisms in the inner ear due to very loud noise. Symptoms may include hearing loss; usually partial and high-pitched sounds; may progressively worsen; tinnitus (ringing in the ear).

Action Level (AL): The action level is the noise level threshold at which the University will take action and enroll exposed employees into the Hearing Protection Program.

Audiogram: A graphic record of hearing ability for various sound frequencies that is used to measure hearing loss.

Baseline Audiogram: The audiogram obtained before employment or within the first 6 months of employment that is preceded by a period of at least 14 hours of quiet. The baseline audiogram is the audiogram against which subsequent audiograms will be compared for the calculation of significant threshold shift.

Continuous noise: Noise with negligibly small fluctuations of level within the period observation (ANSI S320-1995: stationary noise; steady noise).

Crest factor: Ten times the logarithm to the base ten of the square of the wideband peak amplitude of a signal to the time-mean-square amplitude over a stated time period. Unit, dB (ANSI S320-1995: crest factor).

Decibel (dB): Unit of level when the base for the logarithm is the 10^{th} root of 10 and the quantities concerned are proportional to power (ANSI SI.I-I994: decibel).

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

Derate: To use a fraction of a hearing protector's noise reduction rating (NRR) to calculate the noise exposure of a worker wearing that hearing protector. (See NRR below.)

Dose: The amount of actual exposure relative to the amount of allowable exposure, and for which 100% and above represents exposures that are hazardous. The noise dose is calculated according to the following formula:

$$D= (C_1/T_1 + C_sT_2 + \ldots + C_n/T_n) \times 100$$

Where:
C = total time of exposure at a specified noise level
T = exposure time at which noise for this level becomes hazardous

Effective noise level: The estimated A-weighted noise level at the ear when wearing hearing protectors. Effective noise level is computed by (1) subtracting derated NRRs from C-weighted

noise exposure levels, or (2) subtracting derated NRRs minus 7 dB from A-weighted noise exposure levels. Unit, dB.

Equal-energy hypothesis: A hypothesis stating that equal amounts of sound energy will produce equal amounts of hearing impairment, regardless of how the sound energy is distributed in time.

Equivalent continuous sound level: Ten times the logarithm to the base ten of the ratio of time-mean-square instantaneous A-weighted sound pressure, during a stated time interval *T,* to the square of the standard reference sound pressure. Unit, dB; respective abbreviations, TA V and TEQ; respective letter symbols , L_{AT} and L_{AvgT} *(ANSI* S1.1-1994: time-average sound level; time-interval equivalent continuous sound level; time-interval equivalent continuous A-weighted sound pressure level; equivalent continuous sound level).

Excess risk*:* Percentage with material impairment of hearing in an occupational-noise-exposed population after subtracting the percentage who would normally incur such impairment from other causes in a population not exposed to occupational noise.

Exchange rate*:* An increment of decibels that requires the halving of exposure time, or a decrement of decibels that requires the doubling of exposure time. For example, a 3-dB exchange rate requires that noise exposure time be halved for each 3-dB increase in noise level; likewise, a 5-dB exchange rate requires that exposure time be halved for each 5-dB increase.

Fence: The hearing threshold level above which a material impairment of hearing is considered to have occurred.

Frequency: For a function periodic in time, the reciprocal of the period Unit, hertz (Hz) (ANSI S1.1-1994: frequency).

Hearing threshold level (HTL): For a specified signal, amount in decibels by which the hearing threshold for a listener, for one or both can, exceeds a specified reference equivalent threshold level. Unit, dB (ANSI SI.1-1994: hearing level; hearing threshold level).

High Noise: The 8-hour time weighted average (TWA) at or above 85 dBA on the A scale.

Immission level: A descriptor for noise exposure, in decibels, representing the total sound energy incident on the ear over a specified period of time (e.g., months, years).

Impact: Single collision of one mass in motion with a second mass that may be in motion or at rest (ANSI S1.1-1994: impact).

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 to a final time, the force being time-dependent and equal to zero before the initial time and after the final time (ANSI SI.I-I994: impulse).

Impulse noise*:* A sharp rise and rapid decay in sound levels and is less than 1 sec in duration. For the purposes of this document. it refers to impact or impulse noise.

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) Erratic, intermittent, or statistically random oscillation (ANSI S 1.1-1994: noise).

Noise reduction rating: The NRR indicates a hearing protector's noise reduction capability, it 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. Units in dB.

Permanent threshold shift (PTS): Permanent increase in the threshold of audibility for an ear. Unit. dB (ANSI S320-1995: permanent threshold shift; permanent hearing loss).

Pulse range: Difference in decibels between the peak level of an impulsive signal and the root-mean-square level of a continuous noise.

Significant threshold shift: A shift in hearing threshold, outside the range of audiometric testing variability (±S dB), that warrants follow up action to prevent further hearing loss. NIOSH defines significant threshold shift as an increase in the HIL of l5 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 of the first test.

Sound: (I) Oscillation in pressure, stress, particle displacement, particle velocity, etc. in a medium with internal forces (e.g., elastic or viscous), or the superposition of such propagated oscillations. (2) Auditory sensation evoked by the oscillation described above (ANSI SI.I-I994: sound).

Sound intensity: Average rate of sound energy transmitted in a specified direction at a point through a unit area normal to this direction at the point considered. Unit, watt per square meter (W/m^2); symbol, *I* (ANSI SLl-I994: sound intensity; sound-energy flux density; sound-power density).

Sound intensity level: Ten times the logarithm to the base ten of the ratio of the intensity of a given sound in a stated direction to the reference sound intensity of 1 pico Watt per square meter (W/m^2); Unit. dB; symbol, *L* (ANSI SLl-I994: sound intensity level).

Sound pressure: Root-mean-square instantaneous sound pressure at a point during a given time interval Unit, Pascal (pa) (ANSI SLl-I994: sound pressure; effective sound pressure).

Sound pressure level: (I) Ten times the logarithm to the base ten of the ratio of the time-mean-square pressure of a sound, in a stated frequency band, to the square of the reference sound pressure in gases of 20 micropascals (p.Pa). Unit, dB; symbol, *Lp.* (2) For sound in media other than gases, unless otherwise specified, reference sound pressure in 1 llPa (ANSI S 1.1-1994: sound pressure level).

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 caused by other means such as use of aspirin or other drugs. Unit, dB. (ANSI S3.20-1995: temporary threshold shift; temporary hearing loss).

Time-weighted average (TWA): The averaging of different exposure levels during an exposure

period. For noise, given an 85-dBA exposure limit and a 3-dB exchange rate, the TWA is calculated according to the following formula: TWA = 10.0 x Log(D/lOO) + 85 where D = dose.

Varying noise: Noise, with or without audible tones, for which the level varies substantially during the period of observation (ANSI S3.20-1995: non-stationary noise; non-steady noise; time-varying noise).

APPENDIX B

AIHA EXPOSURE LIMIT RECOMMENDATION LETTER

Your Essential Connection

March 26, 2007

The Honorable Edwin G. Foulke, Jr.
Assistant Secretary of Labor
Occupational Safety and Health Administration
U.S. Department of Labor
200 Constitution Avenue, NW
Washington, DC 20210

Dear Assistant Secretary Foulke:

One of the greatest challenges and concerns we now face in the United States is the hearing loss that is occurring in our workforce. Over 30 million workers are exposed to hazardous levels of noise, and noise-induced hearing loss is one of the most common occupational diseases. Such hearing loss significantly affects the ability to communicate and negatively impacts a worker's quality of life.

The American Industrial Hygiene Association (AIHA) believes we cannot wait any longer to address this issue and encourages the Occupational Safety and Health Administration (OSHA) to take immediate action to lower the Permissible Exposure Limit (PEL) for occupational noise exposure to 85 dBA (as an 8-hour TWA) and to adopt the 3 dB exchange rate. AIHA strongly believes the 85 dBA limit and 3 dB exchange rates are appropriate for both the General Industry and Construction standards.

AIHA has supported this position for some time through the work of the AIHA Noise Committee. This committee provides health and safety professionals, the industry, and the community a forum for disseminating and exchanging ideas and information about the effects of exposure to noise and vibration, the control thereof, and methods of hearing conservation.

Review of the damage risk estimation upon which the current regulation is based indicates that even a currently compliant Hearing Protection Plan– that is, one where workers are exposed up to 90 dBA TWA with no hearing protection – will yield up to 26% excess risk of material hearing impairment over the course of a working lifetime. It is unimaginable that any other regulated hazard would permit 20-30% of the exposed population to have material impairment. Lowering the PEL to 85 dBA would reduce the number of workers at risk by at least one-half.

Many agencies and organizations in the U.S. have adopted an occupational exposure limit of 85 dBA, with a 3 dB exchange rate. Both the National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial

Hygienists (ACGIH) have long recommended such exposure limits. The U.S. Department of Defense (DOD) and all three branches of the military use the 85 dBA exposure limit. In addition, DOD endorses the use of the 3 dB exchange rate; the Army and Air Force have adopted this rate, and the Navy is in the process of adopting it.

The vast majority of the nations of the world regulate workers' noise exposures at lower levels than the U.S. In fact, the U.S. is one of only two nations that still uses the 90 dBA PEL and is one of three nations that uses the 5 dB exchange rate. As a result, American workers are allowed exposure to noise levels that would result in more hearing loss than the rest of the world.

Lowering the PEL to 85 dBA may also streamline management of hearing conservation programs by adopting a single threshold trigger for all hearing loss prevention activity such as engineering controls, training, hearing protection, and hearing conservation programs.

AIHA urges OSHA to take immediate action on this issue to ensure that American workers are afforded the same level of protection from hazardous noise that the majority of the world's nations, and our own military, provide their workers. Technical background for our position is reflected in a position paper on the regulation of occupational noise exposure written by Dr. Alice Suter in December 2006 for the Hearing Protection Group of the International Safety Equipment Association (ISEA). AIHA would be more than happy to forward a copy of this position paper if you feel there is need to review additional background on the issue.

Founded in 1939, AIHA is the premier association of occupational and environmental health and safety professionals. AIHA members represent a cross-section of industry, private business, labor, academia, and government. The AIHA Noise Committee is but one of more than 30 technical committees that deal with the health and safety challenges facing workers and occupational health and safety experts everywhere.

Thank you for your consideration of this request and your continuing efforts to address this important issue. Please contact me should you have any questions.

Sincerely,

(signature)
Frank M Renshaw

Frank M Renshaw, PhD, CIH, CSP
President

cc: AIHA Board of Directors
Laurel Davis, AIHA Noise Committee Chair
Steven Davis, AIHA Executive Director
Aaron Trippler, AIHA Director Government Affairs

APPENDIX C

BENCHMARK OF PEER INSTITUTIONS PROGRAM EXPOSURE LIMITS

	Benchmark Institution Hearing Conservation Program	8-hour TWA PEL for Noise (dBA)
1	Stanford University http://www.stanford.edu/dept/EHS/prod/mainrencon/occhealth/hearing_conservation_program.pdf	85
2	West Virginia University http://ehs.wvu.edu/r/download/57855	85
3	Arizona State University http://www.asu.edu/aad/manuals/ehs/ehs110.html	85
4	Purdue University http://www.purdue.edu/rem/home/booklets/HPP.pdf	85
5	Princeton University http://web.princeton.edu/sites/ehs/healthsafetyguide/B5.htm	85
6	Harvard University http://www.uos.harvard.edu/ehs/ih/hearing_conservation_program.pdf	85
7	Cornell University http://www.ehs.cornell.edu/ochs/hear_consv_prog.cfm	85
8	University of Florida http://www.ehs.ufl.edu/General/hearpol.htm	85
9	University of Washington http://depts.washington.edu/occnoise/index.html	85
10	Iowa State University http://www.ehs.iastate.edu/publications/manuals/hearing.pdf	85
11	University of Maryland http://www.des_umd.edu/os/hearing/manuallindex.html	85
12	Texas A&M University http://ehsd.tamu.edu/documents/TAMUSafetyManual/2_GeneralSafety.pdf	85
13	University of North Carolina http://ehs.unc.edu/ih/noise.shtml	85

APPENDIX D

COMPARISON OF HPD CHARACTERISTICS, FEATURES, AND USABILITY ISSUES

Comparison of HPD Characteristics, Features, and Usability Issues[1]

Issue	Earplugs	Earmuffs
Comfort and personal preference	Preferable for long use periods, but some may hesitate to insert anything into the ear canal; may require period of adjustment	Preferable for multiple applications/removal per day; however some may not like pressure on the head; bulky
Protection	High level of protection, but dependent on user training, skill and motivation	More reliable protection, less dependent on user training, skill and motivation
Sizing	May be one size-fits-all, but proper fitting still needs to be verified; may also come in sizes, which still require fit verification	Generally one-sized devices; however band and cuff fit should be verified to accommodate head and outer ears
Ease of fitting	For good protection, training, skill and care are required	Careful fitting not as critical as earplugs
Compatibility	Generally not affected by hair style/length, glasses, earrings or other PPE	Seal against head can be broken by hair, glasses, hats and other PPE
Use in tight spaces	Ideal for tight spaces	May interfere with movement in tight spaces
Monitoring use	May be difficult for supervisors to visually verify use at a distance	Use can be verified at a distance by supervisor
Use in hot environments	Sweat buildup may occur; however, usually preferable to earmuffs	May be uncomfortable with likely sweat buildup under cups
Use in cold environments	Can be worn under cold weather gear such as caps, muffs, etc. Difficult to insert with gloved hand	May provide warmth, however seals may harden; can be adjusted with gloved hand
Storage, portability, and loss	Easy to store/carry; may wear around neck on cord when not in use. Easy to misplace	Not as easy to misplace; however may be bulky, more difficult to store. May be worn on belt clip
Sabotage	Wearers may cut, puncture or whittle to improve comfort which limits protection.	Wears may stretch the band for pressure relief or drill cups for ventilation, which limits protection.
Ear infection or earwax buildup	Cannot be used when wearer has ear infection, impacted wax, or other ear canal medical condition.	May be used if wearer has minor ear infection; earwax does not affect usage; however not usable with outer ear or skin conditions.

1. Adapted from *The Noise Manual, 5th Edition.*

APPENDIX E

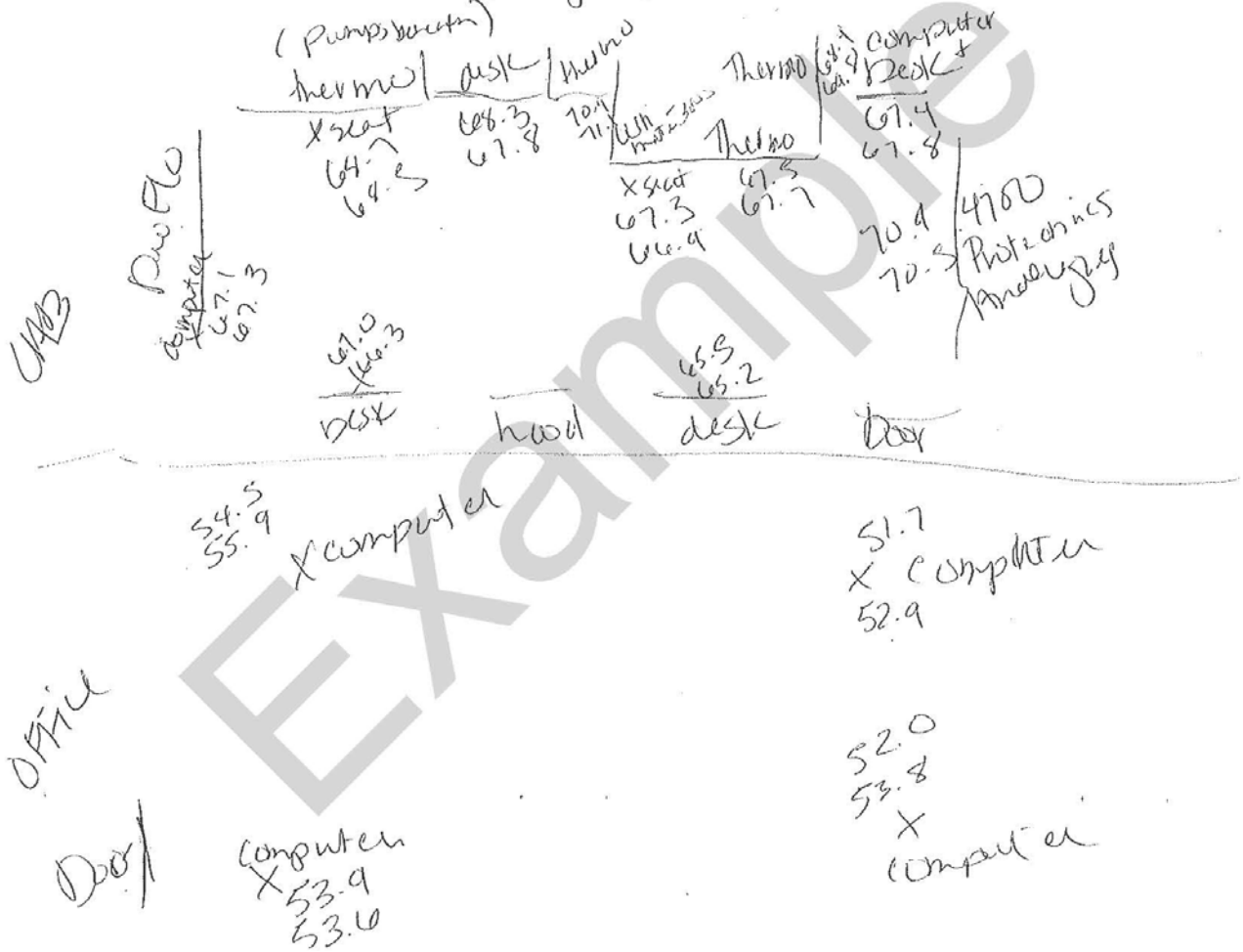
EXAMPLE SAMPLING FORM

Environmental Health & Safety

Field Sampling Collection Form

Date 12/7/2011 Location (Bldg. & Room) MBB. 1.420 C Collected By MLT

Employee/Area Monitored Lab + adjoining office Time On N/A Time Off N/A



Pre Cal 11.4 Post Cal 11.4 Cal Date 12/7/11 Instrument Used SPL Serial No. 11030397

PPE Worn N/A Reviewed By _____

\\ecs-rahn\records$\IndustrialHygiene\SamplingForm.docx.

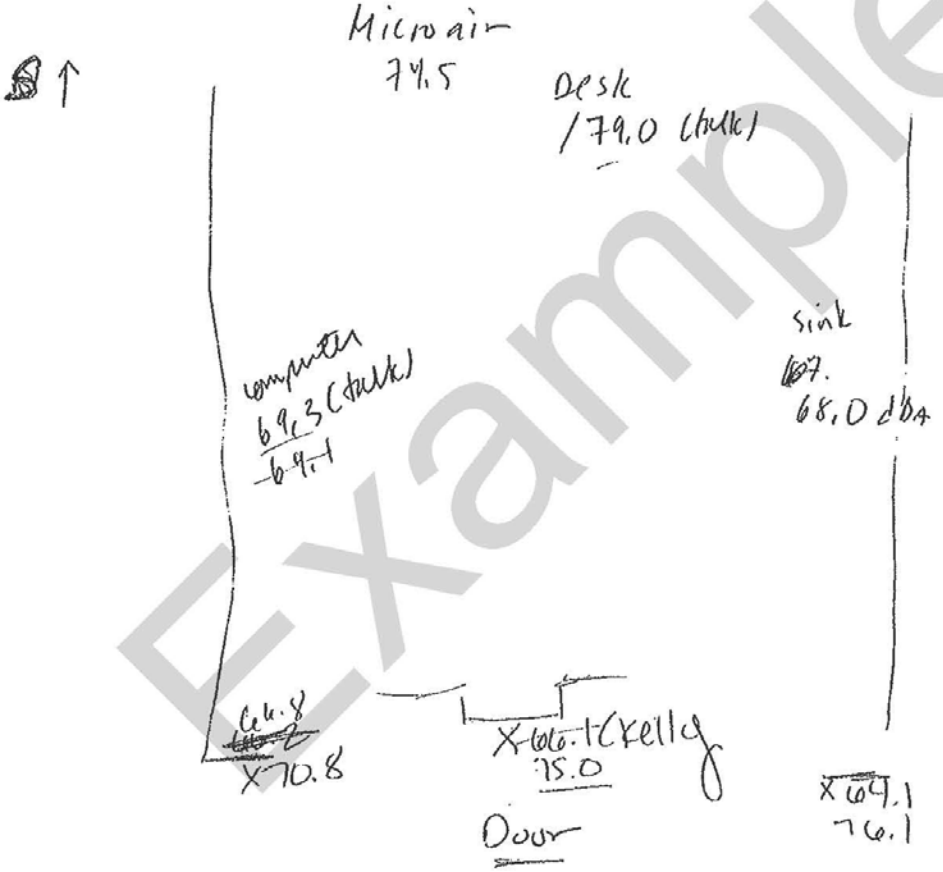
THE UNIVERSITY OF TEXAS AT AUSTIN
ENVIRONMENTAL HEALTH AND SAFETY DEPARMENT
HEARING CONSERVATION PROGRAM

Environmental Health & Safety

Field Sampling Collection Form

Date 10/11/2011 Location (Bldg. & Room) CRE 5.518 Collected By EG, MH

Employee/Area Monitored N/A Time On N/A Time Off N/A



Pre Cal 113.9 Post Cal 114.4 Cal Date 9/26/2011 Instrument Used SPL Serial No. 1030397

PPE Worn Lab coats, close-toed shoes Reviewed By EC

\\ecs-rahn\records$\IndustrialHygiene\SamplingForm.docx.

Cal serial # QIK090059

APPENDIX F

EXAMPLE SAMPLING RESULTS FORM

Environmental Health & Safety

University of Texas at Austin

Monitoring Results Noise Sampling

On March 10, 2011, Mr. Chip Monk wore a personal noise monitor on the clean side of the cage washing area. The time weighted 8-hour average for this time was 82.0 dBA. Based on these monitoring results no hearing protection is required at this time. Please continue to wear any other personal protective equipment that may be required for your job.

If you have any questions, please do not hesitate to contact me.

_____

Charlie S. Jamison, CSP, CIH

For your information we are currently in the process of formulating a hearing protection standard. The action level listed in this letter may change.

Environmental Health & Safety

University of Texas at Austin

Monitoring Results Noise Sampling

On March 11, 2011, Mr. Chip Monk wore a personal noise monitor on the clean side of the cage washing area. The time weighted 8- hour average for this time was 86.6 dBA. Based on these monitoring results hearing protection is required at this time in this area. Ms. Supervisor will discuss hearing protection options. Based on these results, you are required to enter the University Hearing Protection Program. Your supervisor or safety coordinator will discuss this with you.

Please continue to wear any other personal protective equipment that may be required for your job.

If you have any questions, please do not hesitate to contact me.

_____

Charlie S. Jamison, CSP, CIH

For your information we are currently in the process of formulating a hearing protection standard. The action level listed in this letter may change.

APPENDIX G

RESOURCES

1. American Conference of Governmental Industrial Hygienist (ACGIH)
   http://www.acgih.org/home.htm

2. American Industrial Hygiene Association (AIHA)
   http://www.aiha.org/Pages/default.aspx

3. American National Standards Institute (ANSI)
   http://www.ansi.org/

4. Berger EH, Royster LH, Royster JD, Driscoll DP and Layne M. *The Noise Manual, 5th Ed.* American Industrial Hygiene Association; Farifax, VA: 2003.

5. Brookhaven National Laboratory
   http://www.bnl.gov/world/

6. The National Institute for Occupational Safety and Health (NIOSH)
   http://www.cdc.gov/niosh/

7. NIOSH *Criteria for a Recommended Noise Standard*
   http://www.cdc.gov/niosh/docs/98-126/chap1.html

8. OSHA 29 CFR 1910.95
   http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=9735&p_table=STANDARDS