FEBRUARY 2025

ENVIRONMENTAL HEALTH & SAFETY

HEARING CONSERVATION PROGRAM

UNC CHARLOTTE
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I. Purpose

The purpose of this program is to comply with the Occupational Safety and Health Administration (OSHA) Occupational Noise Exposure standard 29 CFR 1910.95. The standard outlines protections against the effects of noise exposures and requires a continuing, effective hearing conservation program be administered whenever employee noise exposures equal or exceed an 8-hour time-weighted average (TWA) of 85 decibels measured on the A scale (slow response) or, equivalently, as dose of fifty percent (action level). The Permissible Noise Exposure table outlines acceptable noise levels in Appendix A.

II. Scope

This program applies to all University employees when information indicates that noise exposures may equal or exceed an 8-hour TWA of 85 decibels.

III. Definitions

A. A-weighted decibel

The A-weighted decibel or dBA, is a type of decibel measurement which closely represents the manner in which a human ear responds to noise.

B. Action level

An 8-hour time-weighted average of 85 decibels measured on the A-scale, slow response, or equivalently, a dose of fifty percent.

C. Audiogram

A chart, graph, or table resulting from an audiometric test showing an individual's hearing threshold levels as a function of frequency.

D. 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.

E. Audiometry

A method of hearing assessment that tests an individual’s ability to hear sounds of different intensities and frequencies. Audiometry detects early, asymptomatic noise induced hearing loss before the affected individual is even aware that it is happening.

F. Baseline audiogram

The audiogram against which future audiograms are compared.

G. Criterion sound level

A sound level of 90 decibels.

H. Decibel (dB)

The decibel is a unit of measurement of sound pressure level that is a logarithmic and dimensionless.

I. Hertz (Hz)

Unit of measurement of frequency, numerically equal to cycles per second.

J. Noise

In general, noise is considered to be any unwanted sound. The University's Hearing Conservation Program targets noise levels and noise exposures that are associated with noise-induced hearing loss.

K. Noise dose

The ratio, expressed as a percentage, of (1) the time integral, over a stated time or event, of the 0.6 power of the measured SLOW exponential time-averaged, squared A-weighted sound pressure and (2) the product of the criterion duration (8 hours) and the 0.6 power of the squared sound pressure corresponding to the criterion sound level (90 dB).

L. Noise dosimeter

An instrument that integrates a function of sound pressure over a period of time in such a manner that it directly indicates a noise dose.

M. Noise dosimetry

This noise assessment technique measures an employee's personal noise exposure and is particularly useful and applicable when employees work in numerous noisy areas for short durations at a time or perform different noisy operations on any given day.

N. Noise hazard area

An area is considered a noise hazard area if the sound levels regularly exceed 85 dBA.

O. Noise Survey

Noise survey is another noise assessment technique that provides valuable information regarding sound levels in an area. The most common type is a general noise survey which measures sound levels in A-weighted decibels (dBA).

P. Otolaryngologist

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

Q. Representative exposure

Measurements of an employee's noise dose or 8-hour time-weighted average sound level that the employers deem to be representative of the exposures of other employees in the workplace.

R. Sound level

Ten times the common logarithm of the ratio of the square of the measured A-weighted sound pressure to the square of the standard reference pressure of 20 micropascals. Unit: decibels (dB). For use with this regulation, SLOW time response, in accordance with ANSI S1.4-1971 (R1976), is required.

S. Sound level meter

An instrument for the measurement of sound level.

T. Standard threshold shift

A change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear.

U. Time-weighted average sound level

That sound level, which if constant over an 8-hour exposure, would result in the same noise dose as is measured.

IV. Hearing Conservation Responsibilities

A. Executive Leadership

UNC Charlotte has the responsibility to ensure compliance with OSHA standards

B. Program Administrator

The Environmental Health and Safety (EHS) Office is responsible for:

1. Planning and recommending programs that adhere to all applicable federal, state, and local laws and regulations pertaining to environmental health and safety.
2. Assisting supervisors with implementing environmental health and safety programs in their areas.
3. Periodically reviewing the program and updating it as needed to ensure compliance with all applicable federal and state regulations.

C. Departmental Management

Management is responsible for:

1. Planning and developing budget requests for departmental safety programs.
2. Developing safety procedures, work practices, and safe working areas for all those under their supervision.
3. Supporting safety and health as a model to those they supervise.
4. Supplying appropriate equipment and training.
5. Enforcing environmental health and safety regulation by invoking disciplinary action or administrative sanction.

D. Employee

Every UNC Charlotte employee is responsible for conducting himself/herself in accordance with this program. All employees shall:

1. Adhere to all safety policies, programs, procedures, and practices while performing his/her duties in a safe manner.
2. Notifying your immediate supervisor of unsafe working conditions, potential hazards and accidents as soon as possible.

V. Program Elements

A. University employees whose measured noise exposure equals or exceeds an 8-hour TWA of 85 decibels will be required to participate in the University Hearing Conservation Program. The Hearing Conservation program will consist of the following:

1. Noise monitoring, observations, notifications and controls
2. Posted OSHA noise standard
3. Audiometric hearing testing and requirements
4. Hearing protectors and attenuation
5. Training
6. Access to training and information
7. Recordkeeping

B. If noise levels exceed 85 dBA, the OSHA Occupational Noise Exposure Standard 1910.95 requires that noise control measures must be investigated, evaluated and where feasible, utilized to reduce employee exposures.

VI. Noise Monitoring

A. An ongoing noise monitoring program is required under the OSHA Standard for Occupational Noise Exposure when information indicates that any employee's exposure may equal or exceed an 8-hour TWA of 85 decibels. The University's sampling strategy will consist of area and personal noise monitoring. These strategies are designed to identify employees for inclusion in the hearing conservation program and to enable the proper selection of hearing protectors.

B. All continuous, intermittent and impulsive sound levels from 80 decibels to 130 decibels shall be integrated into the noise measurements.

C. Instruments used to measure employee noise exposure shall be calibrated to ensure measurement accuracy.

D. Monitoring shall be repeated whenever a change in production, process, equipment or control increases noise exposures to the extent that, 1) additional employees may be exposed to noise levels that equal or exceed 85 dBA; or 2) the attenuation provided by the hearing personal protective equipment may render inadequate.

E. A representative sample of area and personal noise monitoring will be repeated periodically. Areas where the noise levels have dropped below 80 decibels due to alterations in equipment, controls or process changes may be eliminated from the monitoring program.

F. Affected employees or their representatives will be provided with an opportunity to observe any noise measurements conducted.

G. Area Noise Monitoring

Area noise monitoring is performed by obtaining measurements of noise levels using a calibrated sound level meter to identify work areas where employees' exposures may equal or exceed an 8-hour TWA of 85 decibels requiring more thorough exposure monitoring. Area noise monitoring is conducted using a calibrated sound level meter set to the A scale, slow response. Measurements are obtained from multiple representative locations in the areas of concern. Measurement locations may include:

1. In the hearing zone at the employee's normal work location;
2. Next to the noise source(s);
3. At the entrance(s) to the work area;
4. At other locations within the area where the employee might work.

H. If noise levels are below 85 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.

I. If any of the area noise measurements equal or exceed 85 decibels (dBA), noise monitoring may be conducted using a calibrated noise dosimeter to determine 8-hour TWA exposure.

J. Personal Noise Monitoring

1. Personal noise monitoring is conducted 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.
2. At the end of the work shift, the dosimeter will be removed and information analyzed as soon as possible. Those employees whose noise exposures equal or exceed 85 dBA as an 8-hour TWA will be notified of the monitoring results.

VII. Noise Control Measures

Where employee noise exposures can exceed 85 dBA, appropriate noise control strategies are developed and implemented. Control strategies will include engineering controls and administrative controls.

A. Engineering Controls

Noise levels are to be reduced through engineering controls where feasible or practical. Engineering controls may include barriers, vibration damping, source isolation, and sound absorbing enclosures. When new equipment is purchased, consideration shall be given to the noise levels generated and the potential exposure of employees working with or near the equipment.

B. Administrative Controls

1. Where engineering controls are not practical or feasible, administrative controls must be considered. Administrative controls include changes in work procedure, rescheduling of the high noise activity, or decreasing the duration of exposure through rotation of workers.
2. Clearly visible warning signs are posted at the approaches to an area where noise levels regularly exceed 85 dBA. These warning signs must clearly indicate that the use of hearing personal protective equipment is required.

C. Hearing Personal Protective Equipment (Hearing Protectors)

1. Where engineering and/or administrative controls are not feasible, hearing personal protective equipment must be used where noise levels equal or exceed 85 dBA or where an individual's personal exposure may exceed the limits set in Table 1.
2. Hearing protectors include earplugs and earmuffs. A variety of styles are available.
3. Hearing protectors shall be made available to all program participants. Supervisors of affected employees shall maintain a selection of hearing protectors that are accessible to all program participants. At the discretion of the supervisor, earmuffs may also be provided to program participants. Earmuffs are suggested where the use of hearing protectors will be intermittent over the course of the work shift. Earmuffs will not be shared between workers and will be individually assigned. Supervisors may contact EHS for assistance in the selection, proper use, and/or procurement of hearing personal protective equipment.
4. The life of the hearing protectors is dependent on the care it is given. A foam type hearing protector is disposable. But as long as it is clean, it may be used until it no longer expands. How long the hearing protectors' lasts is unique to each employee depending on the makeup of their body.

5. Typical life of hearing protectors:

a. Sponge Foam Plugs: 1 or 2 days
b. Custom Plugs: 18-24 months
c. Insert Plugs: 4-6 months
d. Muffs: Replace when worn out

D. Hearing Protection Selection

1. Hearing protectors are selected based on their ability to reduce the sound level exposure to below 85 dBA. One-way hearing protectors are evaluated/selected is based on their Noise Reduction Rating (NRR) developed by the Environmental Protection Agency (EPA). See Figure 1 below for an example of a Noise Reduction Rating label.

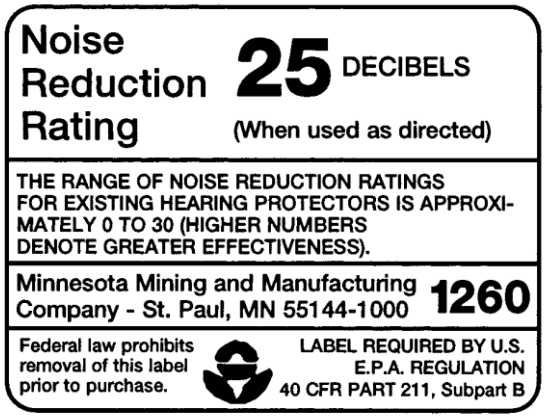

Figure 1

2. The NRR describes the average sound level reduction (attenuation) provided by a hearing protector in a laboratory test. Since the NRR is based on laboratory testing, it does not consider the loss of protection that occurs when hearing protectors are not fit properly or when they are not worn for the entire time that the wearer is exposed to noise.
3. Hearing protector attenuation shall be evaluated by EHS for the specific noise environments in which the protectors will be used (Appendix B, Methods for Estimating the Adequacy of Hearing Protection Attenuation). Hearing protectors must be selected which attenuate employee exposure at least to an 8-hour time-weighted average of 85 decibels. Re-assessment of attenuation will be performed as needed for changes in noise environment or hearing protectors.

VIII. Audiometric Testing

A. All employees whose exposures equal to exceed an 8-hour time-weighted average of 85 decibels will be provided audiometric testing at no cost. The audiometric testing shall be pure tone, air conduction, hearing threshold examinations, with test frequencies including as a minimum 500, 1000, 2000, 3000, 4000, and 6000 Hz. Test at each frequency shall be taken separately for each ear. Audiometric testing shall be conducted with audiometers that meet the specification of and are maintained and used in accordance with American National Standards Specifications for Audiometers.

B. The University will select an outside vendor to provide audiometric testing services and ensure the testing meets OSHA requirements. The audiometric testing requirements are listed below:

1. Pulsed-tone and self-recording audiometers, if used, shall meet the requirements specified in Appendix C, Audiometric Measuring Instruments
2. Audiometric examinations shall be administered in a room meeting the requirements listed in Appendix D, Audiometric Test Rooms
3. Audiometric calibrations shall be checked acoustically at least annually in accordance with Appendix E, Acoustic Calibration of Audiometers
4. Exhaustive calibration shall be performed at least every 2 years. Test frequencies below 500Hz and above 6000Hz may be omitted from this calibration.

C. Baseline audiometric testing shall be performed upon identification of an employee as a program participant and within 6 months of initial exposure to the action level of 85 dBA (8-hour TWA). Audiometric testing shall be repeated annually thereafter.

D. Mobile test van exception.

1. When mobile test vans are used to meet the audiometric testing obligation, UNC Charlotte shall obtain a valid baseline audiogram within 1 year of an employee's first exposure at or above the action level. Where baseline audiograms are obtained more than 6 months after the employee's first exposure at or above the action level, the employee shall wear hearing protectors for any period exceeding six months after first exposure until the baseline audiogram is obtained.

2. It is required that the baseline audiogram be preceded by at least 14 hours without exposure to workplace noise. Time that hearing protection is worn may be included as part of the 14 hours without exposure to noise. Employees shall be notified that they need to avoid non-occupational noise exposure during the 14 hours prior to the audiometric test.
3. A retest audiogram may be conducted to verify or confirm a hearing threshold result. Times when a retest may be needed:

    a. If an employee has suffered a Standard Threshold Shift, the employer may obtain a retest within 30 days and use the results of the retest as the annual audiogram;
    b. The Audiologist or Physician can request a retest to confirm test results;
    c. When problems are suspected by the test administrator.

IX. Standard Threshold Shift

A. Each employee's annual audiogram shall be compared to that employee's baseline audiogram to determine if the audiogram is valid and if a standard threshold shift (STS) as defined by the OSHA Occupational Noise Exposure standard has occurred.

B. If the annual audiogram shows that an employee has suffered a standard threshold shift, the University may coordinate a retest of the employee within 30 days and consider the results of the retest as the annual audiogram. The employee will be notified of the standard threshold shift within 21 days of the determination. The audiologist, otolaryngologist, or physician shall review problem audiograms and shall determine whether there is a need for further evaluation.

C. Unless a physician determines that the standard threshold shift is not work related or aggravated by occupational noise exposure, the University will take the following steps when a standard threshold shift occurs:

    1. Employees not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them.

    2. Employees already using hearing protectors shall be refitted, and retrained in the use of hearing protectors, and provided with hearing protectors offering greater attenuation if necessary.

    3. The employee shall be referred for a clinical audiological evaluation or an otological examination, as appropriate, if additional testing is necessary or if the employer suspects that a medical pathology of

the ear is caused or aggravated by the wearing of hearing protectors.

D. Revised baseline. An annual audiogram may be substituted for the baseline audiogram when, in the judgment of the audiologist, otolaryngologist, or physician who is evaluating the audiogram:

1. The standard threshold shift revealed by the audiogram is persistent; or

2. The hearing threshold shown in the annual audiogram indicates significant improvement over the baseline audiogram.

X. Training and Information

A. All University employees with noise exposures that may equal or exceed an 8-hour TWA of 85 decibels will be required to complete hearing conservation training.

B. The training will include:

1. The effects of noise on hearing;
2. The purpose of hearing protectors; the advantages, disadvantages and attenuation of various types;
3. Instructions on the selection, fitting, care and use of hearing protectors; and
4. The purpose of audiometric testing, and an explanation of the test procedures.

C. The training will be repeated annually for each employee enrolled in the program. The training program will be updated to be consistent with changes in protective equipment and work processes.

D. The OSHA Occupational Noise Exposure standard will be made available to all enrolled employees and posted in an accessible location in the workplace.

XI. Recordkeeping

A. A number of documents are required to be maintained under the OSHA Occupational Noise Exposure Standard once the action level of 85 decibels 8-hour TWA is reached. All records required by the OSHA Occupational Noise Exposure Standard recordkeeping section must be provided, upon request to employees, former employees, representatives

designated by the individual employee, and the Assistant Secretary. The records requirements are listed below:

1. Area noise and personal noise monitoring records shall be retained for two years.
2. Employees will be notified of personal noise monitoring results if exposed at or above an 8-hour TWA of 85 decibels. The records will be retained for two years
3. OSHA Noise standard must be posted in the workplace.
4. Audiometric test records shall be retained for the duration of the affected employee's employment. The records shall include:

    a. Name and job classification of the employee
    b. Date of the audiogram
    c. The examiner's name
    d. Date of the last acoustic or exhaustive calibration of the audiometer
    e. Employee's most recent noise exposure assessment
    f. The measurements of background sound pressure levels in audiometric test rooms.

1. Shall maintain records of the audiometer(s) and testing booth(s) used to conduct employee testing. Documentation is to be provided by testing contractor.
2. Shall also maintain records of hearing conservation training for affected employees.

XII. Recording Hearing Loss on the OSHA 300 Log

An STS must be entered on the OSHA 300 Form within 7 days unless a retest is performed and does not confirm the original STS.

Appendices

Appendix A - Permissible Noise Exposures - Table 1

Duration per day, hours	*Sound level dBA slow response*
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25	115

Appendix B - Methods for Estimating the Adequacy of Hearing Protector Attenuation

For employees who have experienced a significant threshold shift, hearing protector attenuation must be sufficient to reduce employee exposure to a TWA of 85 dB. Employers must select one of the following methods by which to estimate the adequacy of hearing protector attenuation.

The most convenient method is the Noise Reduction Rating (NRR) developed by the Environmental Protection Agency (EPA). According to EPA regulation, the NRR must be shown on the hearing protector package. The NRR is then related to an individual worker's noise environment in order to assess the adequacy of the attenuation of a given hearing protector. This appendix describes four methods of using the NRR to determine whether a particular hearing protector provides adequate protection within a given exposure environment. Selection among the four procedures is dependent upon the employer's noise measuring instruments.

Instead of using the NRR, employers may evaluate the adequacy of hearing protector attenuation by using one of the three methods developed by the National Institute for Occupational Safety and Health (NIOSH), which are described in the "List of Personal Hearing Protectors and Attenuation Data," HEW Publication No. 76-120, 1975, pages 21-37. These methods are known as NIOSH methods No. 1, No. 2 and No. 3. The NRR described below is a simplification of NIOSH method No. 2. The most complex method is NIOSH method No. 1, which is probably the most accurate method since it uses the largest amount of spectral information from the individual employee's noise environment. As in the case of the NRR method described below, if one of the NIOSH methods is used, the selected method must be applied to an individual's noise environment to assess the adequacy of the attenuation. Employers should be careful to take a sufficient number of measurements in order to achieve a representative sample for each time segment.

NOTE: The employer must remember that calculated attenuation values reflect realistic values only to the extent that the protectors are properly fitted and worn.
When using the NRR to assess hearing protector adequacy, one of the following methods must be used:

A. When using a dosimeter that is capable of C-weighted measurements:

   1. Obtain the employee's C-weighted dose for the entire work shift, and convert to TWA (see Appendix A, II).
   2. Subtract the NRR from the C-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

B. When using a dosimeter that is not capable of C-weighted measurements, the following method may be used:

1. Convert the A-weighted dose to TWA (see appendix A).
2. Subtract 7 dB from the NRR.
3. Subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

C. When using a sound level meter set to the A-weighting network:

1. Obtain the employee's A-weighted TWA.
2. Subtract 7 dB from the NRR, and subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

D. When using a sound level meter set on the C-weighting network:

1. Obtain a representative sample of the C-weighted sound levels in the employee's environment.
2. Subtract the NRR from the C-weighted average sound level to obtain the estimated A-weighted TWA under the ear protector.

E. When using area monitoring procedures and a sound level meter set to the A-weighing network.

1. Obtain a representative sound level for the area in question.
2. Subtract 7 dB from the NRR and subtract the remainder from the A-weighted sound level for that area.

F. When using area monitoring procedures and a sound level meter set to the C-weighting network:

1. Obtain a representative sound level for the area in question.
2. Subtract the NRR from the C-weighted sound level for that area.

Appendix C - Audiometric Measuring Instrument

A. In the event that pulsed-tone audiometers are used, they shall have a tone on-time of at least 200 milliseconds.

B. Self-recording audiometers shall comply with the following requirements:

1. The chart upon which the audiogram is traced shall have lines at positions corresponding to all multiples of 10 dB hearing level within the intensity range spanned by the audiometer. The lines shall be equally spaced and shall be separated by at least 1/4 inch. Additional increments are optional. The audiogram pen tracings shall not exceed 2 dB in width.
2. It shall be possible to set the stylus manually at the 10-dB increment lines for calibration purposes.
3. The slewing rate for the audiometer attenuator shall not be more than 6 dB/sec except that an initial slewing rate greater than 6 dB/sec is permitted at the beginning of each new test frequency, but only until the second subject response.
4. The audiometer shall remain at each required test frequency for 30 seconds (+ or - 3 seconds). The audiogram shall be clearly marked at each change of frequency and the actual frequency change of the audiometer shall not deviate from the frequency boundaries marked on the audiogram by more than + or - 3 seconds.
5. It must be possible at each test frequency to place a horizontal line segment parallel to the time axis on the audiogram, such that the audiometric tracing crosses the line segment at least six times at that test frequency. At each test frequency the threshold shall be the average of the midpoints of the tracing excursions.

Appendix D - Audiometric Testing Room

Rooms used for audiometric testing shall not have background sound pressure levels exceeding those in Table D-1 when measured by equipment conforming at least to the Type 2 requirements of American National Standard Specification for Sound Level Meters, S1.4-1971 (R1976), and to the Class II requirements of American National Standard Specification for Octave, Half-Octave, and Third-Octave Band Filter Sets, S1.11-1971 (R1976).

TABLE D-1 MAXIMUM ALLOWABLE OCTAVE-BAND SOUND PRESSURE LEVELS FOR AUDIOMETRIC TEST ROOMS

Octave-band center frequency (Hz)	500	1000	2000	4000	8000
Sound pressure level (dB)	40	40	47	57	62

Appendix E - Acoustic Calibration of Audiometers

Audiometer calibration shall be checked acoustically, at least annually, according to the procedures described in this appendix. The equipment necessary to perform these measurements is a sound level meter, octave-band filter set, and a National Bureau of Standards 9A coupler. In making these measurements, the accuracy of the calibrating equipment shall be sufficient to determine that the audiometer is within the tolerances permitted by American Standard Specification for Audiometers, S3.6-1969.

A. "Sound Pressure Output Check"

1. Place the earphone coupler over the microphone of the sound level meter and place the earphone on the coupler.
2. Set the audiometer's hearing threshold level (HTL) dial to 70 dB.
3. Measure the sound pressure level of the tones at each test frequency from 500 Hz through 6000 Hz for each earphone.
4. At each frequency the readout on the sound level meter should correspond to the levels in Table E-1 or Table E-2, as appropriate, for the type of earphone, in the column entitled "sound level meter reading."

B. "Linearity Check"

1. With the earphone in place, set the frequency to 1000 Hz and the HTL dial on the audiometer to 70 dB.
2. Measure the sound levels in the coupler at each 10-dB decrement from 70 dB to 10 dB, noting the sound level meter reading at each setting.
3. For each 10-dB decrement on the audiometer the sound level meter should indicate a corresponding 10 dB decrease.
4. This measurement may be made electrically with a voltmeter connected to the earphone terminals.

C. "Tolerances"

When any of the measured sound levels deviate from the levels in Table E-1 or Table E-2 by + or - 3 dB at any test frequency between 500 and 3000 Hz, 4 dB at 4000 Hz, or 5 dB at 6000 Hz, an exhaustive calibration is advised. An exhaustive calibration is required if the deviations are greater than 15 dB or greater at any test frequency.

TABLE E-1 - REFERENCE THRESHOLD LEVELS FOR TELEPHONICS - TDH-39 EARPHONES

Frequency, Hz	Reference threshold level for TDH-39 earphones, dB	Sound level meter reading, dB
500	11.5	81.5
1000	7	77
2000	9	79
3000	10	80
4000	9.5	79.5
6000	15.5	85.5

TABLE E-2 - REFERENCE THRESHOLD LEVELS FOR TELEPHONICS - TDH-49 EARPHONES

Frequency, Hz	Reference threshold level for TDH-49 earphones, dB	Sound level meter reading, dB
500	13.5	83.5
1000	7.5	77.5
2000	11	81.0
3000	9.5	79.5
4000	10.5	80.5
6000	13.5	83.5