
HEALTH AND SAFETY PROCEDURE 402 – Hearing Conservation

1.0 PURPOSE

To provide a safe work environment in which all employees are adequately protected from the hazards of noise and to comply with the requirements of the Occupational Safety and Health Administration's (OSHA) Hearing Conservation regulation (29 CFR 1910.95).

2.0 SCOPE

This document is mandated by OSHA whenever an employee's exposure is above the 8-hour time weighted average (TWA) Action Level of 85 decibels (dB) or the 12-hour TWA action level of 82 dB, on the A-weighted (A) scale.

3.0 DEFINITIONS

A-weighted scale—the preferred unit of measurement for noise that approximates the ears' response to moderate level sounds

Action Level--An 8-hour, time-weighted average of 85 decibels or a 12-hour time-weighted average of 82 decibels, measured with a sound level meter on the A-scale, slow response.

Audiogram--A chart, graph, or table produced from an audiometric test that shows an individual's hearing threshold levels by frequency.

Audiometer--An instrument for measuring hearing thresholds.

Baseline Audiogram--The audiogram against which all future audiograms are compared to.

dBA--The sound pressure level in decibels, measured with a sound level meter using A-weighted, slow response settings.

Decibel (dB)--A unit of measure used to express sound pressure level on a logarithmic scale.

Engineering Controls--Methods to control or modify the noise source.

Hearing Protective Devices (HPDs)--Hearing Protection includes earmuffs and/or ear plugs. They protect the wearer by reducing the amount of sound pressure reaching the middle and inner ear.

Hertz (Hz)--A unit to describe sound frequency, which is the number of cycles of sound waves per second.

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Noise--Any unwanted sound.

Noise Dose--An expression of Time-Weighted Average noise level in percent of the allowable limit. For example, 90 dB is equivalent to 100% for an 8 hour shift; 87 dB is equivalent to 100% for a 12-hour shift.

Noise Dosimeter--An instrument worn by an employee throughout their work shift, which integrates sound pressure levels for a period of time and directly indicates a noise dose or equivalent sound level averaged for the work shift.

Permissible Exposure Limit (PEL)—an 8-hour time-weighted average of 90 decibels-A weighted;

Sound Level Meter (SLM)--An instrument that measures sound pressure levels in dB at a given moment.

Standard Threshold Shift (STS)--A change in hearing threshold as compared to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear.

Time-Weighted Average (TWA)--Employee's average noise level over a full shift. The following calculation is used:

$$\text{TWA} = \frac{(N_1)(T_1) + (N_2)(T_2) + \dots + (N_n)(T_n)}{T_t}$$

Where:

N = Noise Level

T = Time

T_T = Total Time

4.0 RESPONSIBILITIES

4.1 Health and Safety (H&S):

4.1.1 Maintains the Plaquemine facility's Hearing Conservation Program.

4.1.2 Conducts sound level measurement surveys throughout the facility.

4.1.3 Establishes "posted noise areas" in the plant where noise levels equal or exceed 85 dBA.

4.1.4 Post "High Noise Areas" in the plant where noise levels equal or

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exceed 105 dBA and would require double hearing protection for work activities lasting greater than one hour.

- 4.1.5 Conducts employee noise dosimetry measurements.
- 4.1.6 Notifies employees of noise dosimetry results.
- 4.1.7 Provides all employee noise dosimetry results to H&S Medical.
- 4.1.8 Identifies all employees to be included in the Hearing Conservation Program.
- 4.1.9 Maintains sound level monitoring equipment and ensures its calibration.
- 4.1.10 Conducts annual training for employees in the Hearing Conservation Program.
- 4.1.11 Evaluates work areas of any employee who has experienced a Standard Threshold Shift.
- 4.1.12 Approves the types of hearing protection devices available through Stores.

4.2 Medical:

- 4.2.1 Conducts employee baseline and annual audiometric testing.
- 4.2.2 Maintains audiometric test results in employees' medical files.
- 4.2.3 Notifies H&S of any employee experiencing a Standard Threshold Shift.
- 4.2.4 Notifies any employee experiencing a Standard Threshold Shift, in writing, within 21 days of the determination. May retest the employee within 30 days.
- 4.2.5 Refers any employee with a Standard Threshold Shift to the Plaquemine Complex, consulting physician for follow-up evaluation.
- 4.2.6 Assists H&S in selecting and fitting insert type hearing protection devices and instructs employees in the proper use and maintenance of hearing protection devices.

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4.2.7 Ensures that all audiometric test equipment, i.e., audiometer, calibration devices, test booth, are properly maintained and calibrated.

4.2.8 Maintains files of all audiometric calibration records.

4.3 Engineering:

4.3.1 Notify H&S of process changes or equipment modifications which may increase noise levels.

4.3.2 Notify H&S of process changes or equipment modifications which may increase noise levels through the normal review process for Class II work orders or Authorization for Capital Transaction (ACT).

4.4 Department Supervision:

4.4.1 Notify H&S of any suspected changes reported by employees.

4.4.2 Enforce the use of engineering controls and hearing protection devices in posted noise areas. Discipline non-compliant employees according to company personnel guidelines.

4.4.3 Ensure that each employee and contractor, in their work area, complies with the Hearing Conservation Program requirements.

4.5 Employees:

4.5.1 Wear and maintain hearing protection devices as instructed.

4.5.2 Report any suspected change in equipment noise levels to their supervisor.

4.5.3 Participate in the Hearing Conservation Program, which includes personal noise dosimetry, audiometric testing, use of hearing protection devices, and training.

4.5.4 Avoid high noise levels for 14 hours before all audiometric testing. (Hearing protection devices may be used.)

4.5.5 Follow physician's recommendations.

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4.6 Contractors:

- 4.6.1 Implement a Hearing Conservation Program for their employees.
- 4.6.2 Notify H&S of any employee experiencing a Standard Threshold Shift.
- 4.6.3 Allow H&S to audit their Hearing Conservation Program.
- 4.6.4 Supply their employees with hearing conservation equipment.

5.0 PROCEDURES

5.1 Noise Level Monitoring

Noise level monitoring is conducted in order to:

- 5.1.1 Identify high noise areas;
- 5.1.2 Determine whether process noise levels have changed significantly;
- 5.1.3 Identify employees for inclusion in the Hearing Conservation Program;
- 5.1.4 Allow proper selection of hearing protection devices; and
- 5.1.5 Evaluate engineering control effectiveness.

5.2 Area Noise Level Measurements

- 5.2.1 Measurements are collected with a Type II sound level meter, calibrated before and after each use.
- 5.2.2 Sound level meters and calibration devices are returned to the manufacturer for testing and calibration on an annual basis by H&S.
- 5.2.3 Area noise level measurements are obtained at predetermined locations to maintain data consistency and allow data comparison.
- 5.2.4 Sound level measurement results are recorded on a plant map, and compared to previous average results from each measurement location.

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- 5.2.5 If a comparison shows a difference of ± 5 dB, H&S will verify the data by repeating the measurements at the location in question. If there is still a difference, H&S will investigate to determine the cause of the change.
- 5.2.6 Area noise level measurement data will be maintained by H&S for at least five years.
- 5.2.7 Area noise surveys will be repeated whenever there is a change in equipment, production process, or controls, which results in an increased employee noise exposure.

5.3 Personal Noise Dosimetry

- 5.3.1 H&S conducts full-shift noise dosimetry measurements to identify employees with an 8-hour time-weighted average equal to or exceeding 85 dBA.
- 5.3.2 Noise dosimetry measurements are collected with a Type II dosimeter capable of integrating all continuous, intermittent, and impulse sound levels from 80 to 130 dB. The dosimeters must have a 5-dB exchange rate, use a 90 dBA criterion level, and use an 80 dBA threshold gate. Dosimeters are calibrated before and after each use.
- 5.3.3 Calibration devices are returned to the manufacturer for testing and calibration on an annual basis by H&S.
- 5.3.4 Employees are notified, in writing, of noise dosimeter results by H&S if the results are at or above the OSHA-Action Level (85 dBA over 8-hr TWA). A copy of the notification form is also sent to medical to be included in the employee's medical file.
- 5.3.5 Employees with an 8-hour time-weighted average equal to or exceeding 85 dBA or a 12-hour time-weighted average equal to or exceeding 82 dBA are included in the Hearing Conservation Program.
- 5.3.6 Noise dosimetry results are also used to evaluate effectiveness of hearing protection devices by using "Methods for Estimating the Adequacy of Hearing Protection Attenuation" found in OSHA's 29 CFR 1910.95. H&S maintains employee noise dosimetry data for at least five years.

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5.4 Hearing Protection Devices

- 5.4.1 Hearing protection devices are available to all Plaquemine Complex employees from Stores and Tool Rooms. A variety of HPDs are maintained so that the employee may choose which HPD is the most appropriate.
- 5.4.2 Employees are required to use hearing protection devices in all process areas and any posted noise area.
- 5.4.3 H&S periodically review HPD attenuation to ensure that the devices available provide proper protection. HPD attenuation is evaluated using OSHA's method contained in 1910.95.

6.0 AUDIOMETRIC TESTING

6.1 Conducting the Test

- 6.1.1 Audiometric tests (hearing tests) are conducted by Medical to determine whether the employee has had any change in their ability to hear sounds. Audiometric tests are scheduled during normal work hours.
- 6.1.2 All employees are given a baseline audiogram during the hiring process.
- 6.1.3 Any employee working in plant operating areas will be given an annual audiogram.
- 6.1.4 Medical schedules hearing tests with employees and notifies them that they should not be subjected to high noise levels for 14 hours before the test. Hearing protection devices may be used.
- 6.1.5 Hearing tests are performed by licensed or certified audiologists, otolaryngologist, or other physicians, or by a technician who is certified by the Council of Accreditation in Occupational Hearing Conservation.

6.2 Audiogram Evaluation

- 6.2.1 Medical compares each employee's annual audiogram to the baseline audiogram to determine if the audiogram is valid and if a Standard Threshold Shift has occurred.

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- 6.2.2 If this comparison indicates that a Standard Threshold Shift has occurred, then the employee may be retested within 30 days and consider the retest results as the annual audiogram.
- 6.2.3 Employees experiencing a Standard Threshold Shift will be notified, in writing, by Medical within 21 days of the determination.
- 6.2.4 If Medical determines that there is a problem with the audiogram or desires outside consultation, Medical will provide the physician, audiologist, or otolaryngologist the following information:
 - 6.2.4.1 A copy of OSHA's Hearing Conservation Requirements;
 - 6.2.4.2 The employee's baseline audiogram and most recent audiogram for evaluation;
 - 6.2.4.3 Audiometric test room background sound pressure level information as required in OSHA's 29 CFR 1910.95. C; and
 - 6.2.4.4 All records of audiometer calibrations.

6.3 Follow-Up Procedures

- 6.3.1 Employees experiencing a Standard Threshold Shift will be notified, in writing, by Medical within 21 days of the determination.
- 6.3.2 In cases where the consulting physician determines that the Standard Threshold Shift is aggravated by occupational noise levels, then the following steps will be taken:
 - 6.3.2.a Employees not using hearing protection will be fitted with hearing protection devices, trained in the proper use and care of hearing protection, and required to use it;
 - 6.3.2.b Employees already using hearing protection will be refitted and retrained in the use of hearing protection and provided with hearing protection devices with greater noise attenuation;
 - 6.3.2.c H&S Medical will refer the employee experiencing a Standard Threshold Shift to a physician for a clinical audiological evaluation or an otological examination if it

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is suspected that a medical pathology of the ear is caused or aggravated by the wearing of hearing protection;

- 6.3.2.d If a medical pathology of the ear which is unrelated to the use of hearing protection devices is suspected, then H&S Medical will notify the employee of the need for an otological examination; and
- 6.3.2.e If audiometric testing of an employee with an 8-hour time-weighted average noise level of less than 85 dBA indicates that the Standard Threshold Shift is not persistent, then H&S Medical will inform the employee of the new audiometric interpretation.
- 6.3.2.f For employees who have experienced a standard threshold shift, hearing protectors must attenuate employee exposure to an 8-hr. TWA of 85 dBA or 12-hr. TWA of 82 dBA or below.

6.3.3 In cases where the consulting physician determines that the Standard Threshold Shift is not due to work related noise exposures based on findings from a pre-audiometric testing interview concerning otological history, then steps 6.3.2.a through 6.3.2.f also apply. However, the Standard Threshold Shift will not result in an OSHA recordable injury.

6.4 Revised Baseline

6.4.1 Medical may substitute an annual audiogram for the baseline audiogram when, in the judgment of the reviewing physician, audiologist, or otolaryngologist:

- 6.4.1.1 The Standard Threshold Shift indicated by the audiogram is persistent; or
- 6.4.1.2 The audiogram indicates significant improvement over the baseline audiogram.

6.5 Audiometric Testing Requirements

6.5.1 All audiometric tests performed for the Plaquemine Complex will be pure tone, air conduction, hearing threshold examinations. Test

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frequencies will include, at a minimum, 500, 1000, 2000, 3000, 4000, and 6000 Hz. Each ear will be tested at each individual frequency.

6.5.2 Audiometers used for audiometric testing will meet the specifications of American National Standards Specifications for Audiometers, S3.6-1989.

6.5.3 Pulsed-tone and self-recording audiometers, may be used if they meet specifications contained in OSHA's 1910.95: "Audiometric Measuring Instruments."

6.5.4 Audiometric tests must be performed in a test booth or room meeting requirements found in OSHA's 1910.95 Appendix D: Audiometric Test Rooms. Requirements are:

Table 1
 Maximum Allowable Octave-Band Sound Pressure Levels in Audiometric Test Rooms

Octave-Band Center Frequency (Hz)	50 0	100 0	200 0	400 0	800 0
Sound Pressure Level DBB)	40	40	47	57	62

6.6 Audiometer Calibration

6.6.1 Medical performs a functional audiometer calibration each day, before the audiometer is used.

6.6.2 Daily functional calibration is performed by an individual with known, stable hearing thresholds and by listening to the audiometer's tones to make sure the signal is free from any distortion or any unwanted sounds such as crackling, humming, or excessive background noise. Earphone cords should be manipulated during the check to detect broken or frayed cords.

6.6.3 Medical personnel will also perform a daily acoustical check using the calibration device in the audiometric test booth. Any deviations

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of 10 dB or greater in any frequency will require an acoustic calibration.

- 6.6.4 Medical maintains a record of the daily acoustic checks, which is dated, signed, and includes information regarding the instrument's performance.
- 6.6.5 Medical ensures that the audiometer receives an annual acoustical calibration meeting the requirements of OSHA's 1910.95: "Acoustic Calibration of Audiometers."
- 6.6.6 Medical maintains a copy of the annual acoustical calibration.
- 6.6.7 Deviations of 15 dB or greater in any frequency during the annual calibration requires an "exhaustive calibration."
- 6.6.8 Every five years Medical will ensure that an "exhaustive" calibration is performed on the audiometer. In addition to the procedures conducted under annual calibration, the exhaustive calibration includes an evaluation of frequency accuracy, test tone distortion, measurement of channel cross-talk, and any other residual or unwanted sounds in the earphones. Verification of the rise and fall times of the tone switch is also checked. Specifications for calibration are contained in American National Standards Specification for Audiometers, S3.6-1989.

7.0 TRAINING

- 7.1 H&S conducts initial and annual training for all employees included in the Hearing Conservation Program.
- 7.2 Employees reassigned to a job activity that is included in the Hearing Conservation Program will receive information and training upon assignment.
- 7.3 H&S provides employees the following information during training:
 - 7.3.1 The effects of noise on hearing;
 - 7.3.2 The purpose of hearing protection devices, advantages, disadvantages, and attenuation of various types of hearing protection;
 - 7.3.3 Instructions on the proper selection, fitting, use, and care of hearing

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protection devices; and information concerning the purpose of audiometric testing, and an explanation of test procedures.

8.0 RECORDS

- 8.1 H&S maintains copies of all sound level meter surveys and noise dosimeter surveys.
- 8.2 Sound level meter survey and noise dosimeter survey records are maintained for at least five years.
- 8.3 Employee noise exposure records shall include:
 - 8.3.1 Name and Job Classification.
 - 8.3.2 Operation being monitored.
 - 8.3.3 Sampling methodology used and evidence of accuracy.
 - 8.3.4 Number, duration and results of samples taken.
 - 8.3.5 Type of hearing protection devices worn.
- 8.4 Medical maintains all employee audiometric test records. The test record includes the following information:
 - 8.4.1 Employee's name and job title;
 - 8.4.2 Date of audiogram;
 - 8.4.3 Examiner's name;
 - 8.4.4 Date the audiometer received an annual or exhaustive calibration;
and
 - 8.4.5 Data from the employee's most recent noise level or dosimetry measurement survey.
- 8.5 Medical maintains all audiometer calibration records and measurements of background sound pressure levels within the audiometric test booth.
- 8.6 Audiometric test records are maintained by Medical for the duration of the employee's employment plus 30 years.

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- 8.7 If an employee terminates employment less than one year from hire date, then Medical will provide the medical record to the employee, so that they may take it to their next employer.
- 8.8 Employees are entitled to review their medical record. Employees should contact Medical to review or obtain a copy of their medical record.

9.0 AUDITS

- 9.1 The Plaquemine Complex Hearing Conservation Program will be audited at least every three years. H&S will ensure this is performed. The purpose is to assess compliance, ensure that all employees who should be included are, and to evaluate program effectiveness. The audit will evaluate:
 - 9.1.1 The current Hearing Conservation Program;
 - 9.1.2 H&S monitoring records;
 - 9.1.3 Medical records;
 - 9.1.4 Employee training records; and
 - 9.1.5 Employee awareness.
- 9.2 Following the audit, the Hearing Conservation Program will be revised to include any necessary changes. Audit results will be documented.
- 9.3 All employees will be informed of any changes made in the plan.

10.0 REFERENCES

American Industrial Hygiene Association (1986). "Noise and Hearing Conservation Manual," 4th edition, edited by E. H. Berger, et al.

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Revision History

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7	Westlake Branding. Review Cycle. Added revision history. Remove unnecessary Appendixes MOC:	H. Garner	4/17/2018
8	Revised Westlake Branding	H. Garner	2/23/2023