

Industrial Hygiene

Protecting workers and communities

From the products and byproducts of industry

Industrial Hygiene affects all of us

By definition industrial hygiene is the science or art devoted to the anticipation, recognition, evaluation, and control of those environmental factors or stresses arising in or from the workplace, which may cause sickness, impaired health and well being, or significant discomfort among workers or among citizens of the community.

AIHA stands for the American Industrial Hygiene Association

- Anticipation
- Recognition
- Evaluation
- Control

There has been awareness dating as far back as 400 BC concerning the affects of environmental factors and the effects of public safety. Let's look back at some of those who recognized risks evaluated those risks and those who set controls in place.

Recognition

- 400 BC - Hippocrates described lead toxicity
- Evaluation
- 162 AD - Galen describes the pathology of lead toxicity and the dangers of acid mists to copper miners
- Control
- 1473 AD - Ulrich Ellenbog publishes a pamphlet on occupational diseases and injuries among gold miners
- 1556 AD - Agricola described the diseases of miners and
- prescribed preventative measurers
- 1700 AD - Bernardino Ramazzini, "the father of industrial medicine" publishes his book on occupational medicine
- 1788 AD - Percival Pott prompts the passage of the "Chimney-Sweepers Act"
- 1837 - The first article on occupational diseases is published in America
- 1913 - New York Department of Labor and Ohio Department of Health establish the first state industrial hygiene programs
 - - All states enact workers compensation laws
- 1970 - US Congress passes the Occupational Safety and Health Act (OHS Act), which created OSHA
- 1977 - US Congress passes the Federal Mine Safety and Health Act

The Industrial Hygienist role today



Industrial hygienists deal with the health and safety challenges facing people everywhere including:

- Indoor air quality (sick building syndrome, second-hand tobacco smoke)
- Evaluating and controlling environmental lead exposure
- Emergency response planning and community right-to-know
- Occupational disease (AIDS in the workplace, tuberculosis, silicosis)
- Potentially hazardous agents such as asbestos, pesticides, and radon gas
- Cumulative Trauma Disorders (repetitive stress injuries, carpal tunnel syndrome)
- Radiation (electromagnetic fields, microwaves)
- Reproductive health hazards in the workplace
- Setting limits on exposure to chemical and physical agents
- Detection and control of potential occupational hazards such as noise, radiation, and illumination
- Hazardous waste management

What Is an Industrial Hygienist? Industrial hygienists are scientists and engineers committed to protecting the health and safety of people in the workplace and the community.

More than 40 % of the compliance officers who inspect America's work place are industrial hygienists.

A professional industrial hygienist is a person possessing either a baccalaureate degree in engineering, chemistry, or physics or a baccalaureate degree in a closely related biological or physical science from an accredited college or university, who also has a minimum of three years of industrial hygiene experience. A completed doctoral in a related physical, biological or medical science or in related engineering can be substituted for two years of the three-year requirement. A completed master's degree in a related physical or biological science or in related engineering can be substituted for one year of the three-year requirement. Under no circumstances can more than two years of graduate training be applied toward the three-year period.

While this definition does not include certification, the American Industrial Hygiene Association recognizes the need for such certification by every professional industrial hygienist as an appropriate hallmark by one's peers and strongly urges all eligible members to obtain American Board of Industrial Hygiene certification.

The American Board of Industrial Hygiene has established that successful candidates for certificates shall attain the status of Diplomat of the American Academy of Industrial Hygiene subject to compliance with requirements established by the American Board of Industrial Hygiene.

The active ABIH certification requires that the person be admitted to examination based upon academic training and 4 years experience for the Certified Industrial Hygienist (CIH), successfully pass a one-day examination, and maintain active professional involvement by re-certification on a 5-year cycle following first certification.

Protecting People

The goal of the industrial hygienist is to keep workers, their families, and the community healthy and safe. They play a vital part in ensuring that federal, state, and local laws and regulations are followed in the work environment.

Typical roles of the industrial hygienist include:

- Investigating and examining the workplace for hazards and potential dangers
- Making recommendations on improving the safety of workers and the surrounding community
- Conducting scientific research to provide data on possible harmful conditions in the workplace
- Developing techniques to anticipate and control potentially dangerous situations in the workplace and the community
- Training and educating the community about job-related risks
- Advising government officials and participating in the development of regulations to ensure the health and safety of workers and their families
- Ensuring that workers are properly following health and safety procedures

Volunteer Groups

Industrial hygienists and other occupational health, safety and environmental professionals volunteer their time, energy, and expertise through AIHA's volunteer groups. AIHA supports the formation and operation of volunteer groups of members who organize to advance the science and practice of industrial hygiene, and thus the interests of AIHA and its members. AIHA also supports leadership development in the form of an annual leadership workshop for volunteer leaders.

The purpose of these groups may include activities in support of the board in the management of the association; facilitation of networking and information exchange among members; development of products, services, and activities for educational purposes; development of guidelines and standards for good practice; development of statements to contribute to public policy debates; collaboration with other institutions; or other activities deemed appropriate by the board.

Industrial Hygiene topics include but are not limited to the following:

- **Toxicology, Chemical Information & MSDS**

- Ergonomics
- Occupational Illness
- Asbestos
- Noise
- Respiratory Protection
- Hazard Communication
- Medical Surveillance
- Health Physics & Radiation
- Laboratories
- General IH Information

Environmental Factors and Stresses

Earlier in this training 4 elements that make the main focus areas of the American Industrial Hygiene Association were listed: **Anticipate, Recognize, Evaluate and Control**. Also other roles fall under the industrial hygienist:

- Develop and issue OSHA Standards
- Provide technical assistance and support
- Provide technical assistance and support
- Perform worksite analysis

During a worksite analysis, the industrial hygienist observes and evaluates the environmental factors of stresses as cited in the definition of the occupation

- **Chemical Hazards include**
 - Gasses, vapors, dusts, fumes, mists and smoke





- **Physical Hazards**

- Non-ionizing and ionizing radiation, noise, vibration, extreme temperatures and pressures



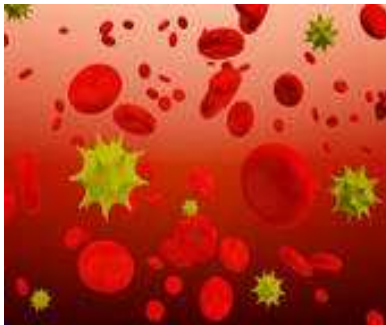
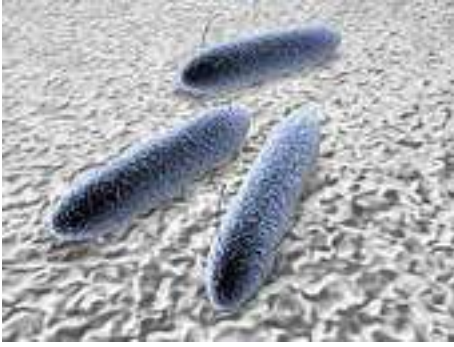
- **Ergonomic Hazards**

- Workstation design, repetitive motion, poor visual conditions, improper reaching and lifting
- Repetition, poorly designed job tasks, improperly designed tools or work areas



- **Biological Hazards**

- Insects, molds, yeasts, fungi, bacteria, viruses
- Living organisms that can cause active and chronic infections



- **Chemical Hazards**
 - Inhalation, absorption, ingestion
 - Physical Hazards
 - Temperature extremes
 - Ionizing radiation





Routes of entry

- Inhalation
- Absorption
- Ingestion



Air Contaminants

Particulates

- Dust
- Fumes
- Mists
- Fibers

What is a particulate?

“Particulate” is a general name given to a tiny solid or liquid particle or piece of matter. It usually refers to particles in the air (airborne particulates).

Where do particulates come from?

There are many sources for particulates in the air. Among them are soil, plants, fires, and road dust.

There are many sources for particulates in the air. Among them are soil, plants, fires, and road dust.

A **major** man-made type is fumes from combustion processes and products, like tobacco smoke, car exhaust, power plants, wood stoves, oil burners or other heating systems. Even burning candles or oil in lanterns can be sources of particulates.

A **second major** type is dust. This includes dust from mechanical processes like grinding or sweeping and common household dust that may include mold, pollen, and small insect parts. Fibrous building material such as fiberglass may also be a source of particulates.

A **third major** type is mist, like that caused by spray painting.

In general, the smaller and lighter a particulate is, the longer it will stay in the air. A dense particulate, such as lead dust, is likely to stay in the air for a shorter period than other particulates. Some particulates, like certain types of fibers or pollen, may stay in the air for very long periods, especially if there is air movement caused by occupants, pets, open windows, fans, office equipment, vacuum cleaners, etc.

Particulates are measured in Microns (micron = 1/25,400 of an inch)

Gases

- Gas as formless fluids = gases which are a formless fluids that can occupy the space of an enclosure.
- Molecules are unrestricted by cohesive forces **Gas** = a fluid with no definite volume or shape whose molecules are practically unrestricted by cohesive forces.

Vapors

- Volatile form of substances that are normally solid or liquid at room temperature and pressure
- **Evaporation** is the process by which a liquid changes to a vapor

Units of Concentration

Ppm = "parts per million" parts of air

mg/m³ = "milligrams per cubic meter" of air

f/cc = "fibers per cubic centimeter" of air

A unit of concentration often used when measuring levels of pollutants in air, water, body fluids, etc. One ppm is 1 part in 1,000,000. The common unit mg/liter is equal to ppm. Four drops of ink in a 55-gallon barrel of water would produce an "ink concentration" of 1 ppm.

From Canadian Center for Occupational Health & Safety

What is the usual way of converting mg/m³ to ppm?

The ACGIH booklet "Threshold Limit Values (TLVsTM) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIsTM)" uses the formulas:

$$\text{TLV in mg/m}^3 = (\text{gram molecular weight of substance}) \times (\text{TLV in ppm}) \times 24.45$$

$$\text{TLV in ppm} = \frac{24.45 \times (\text{TLV in mg/m}^3)}{(\text{gram molecular weight of substance})}$$

These formulas can be used when measurements are taken at 25°C and the air pressure is 760 torr (= 1 atmosphere or 760 mm Hg).

What is gram molecular weight?

Gram molecular weight is the molecular weight (MW) expressed in grams. For example, the gram molecular weight for toluene is 92.13 g. since the molecular weight is 92.13. A gram molecular weight is also called a gram mole.

How do I convert mg/m³ to ppm at different temperatures and pressures?

The number 24.45 in the equations above is the volume (liters) of a mole (gram molecular weight) of a gas or vapor when the pressure is at 1 atmosphere (760 torr or 760 mm Hg) and at 25°C.

To convert mg/m³ to ppm at other temperatures and pressures, one must calculate the volume of 1-gram molecular weight of an airborne contaminant (e.g. 92.13 grams of toluene) by using the formula:

$$V = (RT/P)$$

Where R is the ideal gas constant; T, the temperature in kelvins (273.16 + T°C); and P, the pressure in mm Hg. This information can be substituted in the formulas for converting between mg/m³ and ppm.

$$\text{TLV in mg/m}^3 = (P/RT) \times \text{MW} \times (\text{TLV in ppm})$$

$$= P \times MW \times (\text{TLV in ppm}) \\ 62.4 \times (273.2 + T^{\circ}\text{C})$$

and

$$\text{TLV in ppm} = \frac{62.4 \times (273.2 + TX) \times (\text{TLV in mg/m}^3)}{P \times MW}$$

Where the value of R is 62.4 when the temperature (T) is in kelvins, K (=273.16 + T°C), the pressure is expressed in units of mm Hg and the volume is in liters. There are different values for the gas constant R if the temperature is expressed degrees Fahrenheit (°F) or if other units of pressure (e.g., atmospheres, kilopascals) are used.

Threshold Limit Values (TLVs)

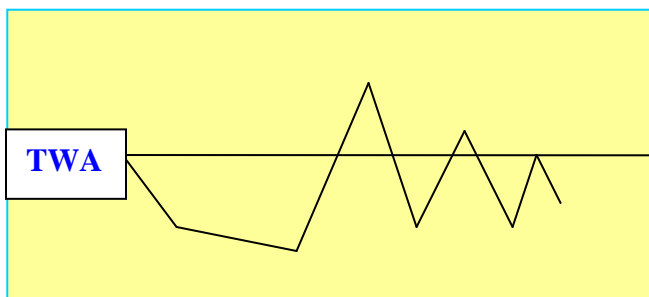
TLVs are established by the American Conference of Governmental Industrial Hygienists (ACGIH) - Permissible Exposure Limits OSHA

TLV is an airborne concentration of a substance under which nearly all workers may be repeatedly exposed without adverse affect.

TLVs are specified in three different ways:

- **Time-Weighted Average (TWA)**
- **Short-Term Exposure Limit (STEL)**
- **Ceiling**

Concentration Graph



TWA allows "excursions" above the line, if they are off set by "excursions" below the line.

STEL is the point just below which employees experience:

- Irritation
Chronic or irreversible tissue damage
- Narcosis above a certain level

STEL is a 15-minute TWA



The ceiling must never be exceeded even for an instant.

Substances may have TLV's for one or more of these three categories

MSDS Relevance

In general, PEL's and TLV-STEL's refer to substances that may be inhaled, although some can be absorbed through the skin or eyes (STEL's will often have "-skin" after them when skin exposure is possible). When working with materials that have listed exposure limits, use proper precautions to minimize the generation of a vapor or dust in the first place. Always use appropriate personal protective equipment (PPE) such as gloves, dust masks, and respirators to limit your exposure to chemicals.

Remember, exposure limits are not some magic threshold that defines the border between safe and dangerous. A PEL or STEL that was acceptable in 1950 may be recognized as dangerously high today. Therefore, always do everything reasonable to limit the airborne release of chemicals or dusts in the first place.



Eye Wash Station

Hearing Conservation

Noise in the workplace is a commonly overlooked environmental factor

OSHA uses a 90 dBA criterion level, hence the 8-hour time weighted average (TWA) of 85 dBA being equal to a 50% dose. The American National Standards Institute's (ANSI's) S12.19 (1996), "Measurement of Occupational Noise Exposure," defines the criterion sound level as, "[t]hat constant sound level in decibels (dBA), which, if it continues for the criterion duration, would provide 100% of an employee's allowable noise exposure."

At 85 dBA or higher - OSHA requires a hearing conservation program

The Occupational Noise Exposure Standard (1910.95) requires the employer to provide hearing protectors to all general industry employees exposed to an 8-hour TWA of 85 decibels at no cost to the employees. This requirement is explicit in the noise standard. The issues being addressed in the proposed revision of 1910.132 for personal protection equipment would not affect or in any way change provisions in existing OSHA standards that address who is to pay for particular PPE (e.g., respirators in health standards).

Not only must employers provide hearing protection to their employees at no cost to the employee, they must provide employees with the opportunity to select their hearing protectors from a variety of suitable devices. At the very minimum, a choice of at least one type of earplug and one type of earmuffs must be provided (preferably more), since individuals may be more comfortable in one type than another. The employer must ensure proper initial fitting and supervise the correct use of all hearing protectors.

Hearing protectors must be replaced as necessary, and their replacement must be paid by the employer. All types of personal protective equipment have a limited life span. The foam seal that surrounds the ear on earmuffs, the flanges on rubber earplugs, and body of foam earplugs, all lose their elasticity. As hearing protectors wear out, their attenuation properties are diminished; the headband on earmuffs also can relax so that the muff no longer provides a snug fit.





An estimated 2.9 million workers exceed the 90 dBA

Hearing Conservation Programs require commitment from:

- Employers
- Supervisors
- Employees

The OSHA Hearing Conservation program is outlined below:

"Hearing conservation program."

1910.95(c)(1)

The employer shall administer a continuing, effective hearing conservation program, as described in paragraphs (c) through (o) of this section, whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level (TWA) of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of fifty percent. For purposes of the hearing conservation program, employee noise exposures shall be computed in accordance with appendix A and Table G-16a, and without regard to any attenuation provided by the use of personal protective equipment.

1910.95(c)(2)

For purposes of paragraphs (c) through (n) of this section, an 8-hour time-weighted average of 85 decibels or a dose of fifty percent shall also be referred to as the action level.

1910.95(d)

"Monitoring."

1910.95(d)(1)

When information indicates that any employee's exposure may equal or exceed an 8-hour time-weighted average of 85 decibels, the employer shall develop and implement a monitoring program.

1910.95(d)(1)(i)

The sampling strategy shall be designed to identify employees for inclusion in the hearing conservation program and to enable the proper selection of hearing protectors.

1910.95(d)(1)(ii)

Where circumstances such as high worker mobility, significant variations in sound level, or a significant component of impulse noise make area monitoring generally inappropriate, the employer shall use representative personal sampling to comply with the

monitoring requirements of this paragraph unless the employer can show that area sampling produces equivalent results.

1910.95(d)(2)(i)

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

1910.95(d)(2)(ii)

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

1910.95(d)(3)

Monitoring shall be repeated whenever a change in production, process, equipment or controls increases noise exposures to the extent that:

1910.95(d)(3)(i)

Additional employees may be exposed at or above the action level; or

1910.95(d)(3)(ii)

The attenuation provided by hearing protectors being used by employees may be rendered inadequate to meet the requirements of paragraph (j) of this section.

1910.95(e)

"Employee notification." The employer shall notify each employee exposed at or above an 8-hour time-weighted average of 85 decibels of the results of the monitoring.

1910.95(f)

"Observation of monitoring." The employer shall provide affected employees or their representatives with an opportunity to observe any noise measurements conducted pursuant to this section.

1910.95(g)

"Audiometric testing program."

1910.95(g)(1)

The employer shall establish and maintain an audiometric testing program as provided in this paragraph by making audiometric testing available to all employees whose exposures equal or exceed an 8-hour time-weighted average of 85 decibels.

1910.95(g)(2)

The program shall be provided at no cost to employees.

1910.95(g)(3)

Audiometric tests shall be performed by a licensed or certified audiologist, otolaryngologist, or other physician, or by a technician who is certified by the Council of Accreditation in Occupational Hearing Conservation, or who has satisfactorily demonstrated competence in administering audiometric examinations, obtaining valid audiograms, and properly using, maintaining and checking calibration and proper functioning of the audiometers being used. A technician who operates microprocessor audiometers does not need to be certified. A technician who performs audiometric tests must be responsible to an audiologist, otolaryngologist or physician.

1910.95(g)(4)

All audiograms obtained pursuant to this section shall meet the requirements of Appendix C: "Audiometric Measuring Instruments."

1910.95(g)(5)

"Baseline audiogram."

1910.95(g)(5)(i)

Within 6 months of an employee's first exposure at or above the action level, the employer shall establish a valid baseline audiogram against which subsequent audiograms can be compared.

1910.95(g)(5)(ii)

"Mobile test van exception." Where mobile test vans are used to meet the audiometric testing obligation, the employer 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, employees shall wear hearing protectors for any period exceeding six months after first exposure until the baseline audiogram is obtained.

1910.95(g)(5)(iii)

Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace noise. Hearing protectors may be used as a substitute for the requirement that baseline audiograms be preceded by 14 hours without exposure to workplace noise.

1910.95(g)(5)(iv)

The employer shall notify employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination.

1910.95(g)(6)

"Annual audiogram." At least annually after obtaining the baseline audiogram, the employer shall obtain a new audiogram for each employee exposed at or above an 8-hour time-weighted average of 85 decibels.

1910.95(g)(7)

"Evaluation of audiogram."

1910.95(g)(7)(i)

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 as defined in paragraph (g)(10) of this section has occurred. This comparison may be done by a technician.

1910.95(g)(7)(ii)

If the annual audiogram shows that an employee has suffered a standard threshold shift, the employer may obtain a retest within 30 days and consider the results of the retest as the annual audiogram.

1910.95(g)(7)(iii)

The audiologist, otolaryngologist, or physician shall review problem audiograms and shall determine whether there is a need for further evaluation. The employer shall provide to the person performing this evaluation the following information:

1910.95(g)(7)(iii)(A)

A copy of the requirements for hearing conservation as set forth in paragraphs (c) through (n) of this section;

1910.95(g)(7)(iii)(B)

The baseline audiogram and most recent audiogram of the employee to be evaluated;

1910.95(g)(7)(iii)(C)

Measurements of background sound pressure levels in the audiometric test room as required in Appendix D: Audiometric Test Rooms.

1910.95(g)(7)(iii)(D)

Records of audiometer calibrations required by paragraph (h)(5) of this section.

1910.95(g)(8)

"Follow-up procedures."

1910.95(g)(8)(i)

If a comparison of the annual audiogram to the baseline audiogram indicates a standard threshold shift as defined in paragraph (g)(10) of this section has occurred, the employee shall be informed of this fact in writing, within 21 days of the determination.

1910.95(g)(8)(ii)

Unless a physician determines that the standard threshold shift is not work related or aggravated by occupational noise exposure, the employer shall ensure that the following steps are taken when a standard threshold shift occurs:

1910.95(g)(8)(ii)(A)

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

1910.95(g)(8)(ii)(B)

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.

1910.95(g)(8)(ii)(C)

The employee shall be referred for a clinical audio logical 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.

1910.95(g)(8)(ii)(D)

The employee is informed of the need for an otological examination if a medical pathology of the ear that is unrelated to the use of hearing protectors is suspected.

1910.95(g)(8)(iii)

If subsequent audiometric testing of an employee whose exposure to noise is less than an 8-hour TWA of 90 decibels indicates that a standard threshold shift is not persistent, the employer:

1910.95(g)(8)(iii)(A)

Shall inform the employee of the new audiometric interpretation; and

1910.95(g)(8)(iii)(B)

May discontinue the required use of hearing protectors for that employee.

1910.95(g)(9)

"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:

1910.95(g)(9)(i)

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

1910.95(g)(9)(ii)

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

1910.95(g)(10)

"Standard threshold shift."

1910.95(g)(10)(i)

As used in this section, a standard threshold shift 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.

1910.95(g)(10)(ii)

In determining whether a standard threshold shift has occurred, allowance may be made for the contribution of aging (presbycusis) to the change in hearing level by correcting the annual audiogram according to the procedure described in Appendix F: "Calculation and Application of Age Correction to Audiograms."

1910.95(h)

"Audiometric test requirements."

1910.95(h)(1)

Audiometric tests shall be pure tone, air conduction, hearing threshold examinations, with test frequencies including as a minimum 500, 1000, 2000, 3000, 4000, and 6000 Hz. Tests at each frequency shall be taken separately for each ear.

1910.95(h)(2)

Audiometric tests shall be conducted with audiometers (including microprocessor audiometers) that meet the specifications of, and are maintained and used in accordance with, American National Standard Specification for Audiometers, S3.6-1969, which is incorporated by reference as specified in Sec. 1910.6.

1910.95(h)(3)

Pulsed-tone and self-recording audiometers, if used, shall meet the requirements specified in Appendix C: "Audiometric Measuring Instruments."

1910.95(h)(4)

Audiometric examinations shall be administered in a room meeting the requirements listed in Appendix D: "Audiometric Test Rooms."

1910.95(h)(5)

"Audiometer calibration."

1910.95(h)(5)(i)

The functional operation of the audiometer shall be checked before each day's use by testing a person with known, stable hearing thresholds, and by listening to the audiometer's output to make sure that the output is free from distorted or unwanted sounds. Deviations of 10 decibels or greater require an acoustic calibration.

1910.95(h)(5)(ii)

Audiometer calibration shall be checked acoustically at least annually in accordance with Appendix E: "Acoustic Calibration of Audiometers." Test frequencies below 500 Hz and above 6000 Hz may be omitted from this check. Deviations of 15 decibels or greater require an exhaustive calibration.

1910.95(h)(5)(iii)

An exhaustive calibration shall be performed at least every two years in accordance with sections 4.1.2; 4.1.3.; 4.1.4.3; 4.2; 4.4.1; 4.4.2; 4.4.3; and 4.5 of the American National Standard Specification for Audiometers, S3.6-1969. Test frequencies below 500 Hz and above 6000 Hz may be omitted from this calibration.

1910.95(i)

"Hearing protectors."

1910.95(i)(1)

Employers shall make hearing protectors available to all employees exposed to an 8-hour time-weighted average of 85 decibels or greater at no cost to the employees. Hearing protectors shall be replaced as necessary.

1910.95(i)(2)

Employers shall ensure that hearing protectors are worn:

1910.95(i)(2)(i)

By an employee who is required by paragraph (b)(1) of this section to wear personal protective equipment; and

1910.95(i)(2)(ii)

By any employee who is exposed to an 8-hour time-weighted average of 85 decibels or greater, and who:

1910.95(i)(2)(ii)(A)

Has not yet had a baseline audiogram established pursuant to paragraph (g)(5)(ii); or

1910.95(i)(2)(ii)(B)

Has experienced a standard threshold shift.

1910.95(i)(3)

Employees shall be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors provided by the employer.

1910.95(i)(4)

The employer shall provide training in the use and care of all hearing protectors provided to employees.

1910.95(i)(5)

The employer shall ensure proper initial fitting and supervise the correct use of all hearing protectors.

1910.95(j)

"Hearing protector attenuation."

1910.95(j)(1)

The employer shall evaluate hearing protector attenuation for the specific noise environments in which the protector will be used. The employer shall use one of the evaluation methods described in Appendix B: "Methods for Estimating the Adequacy of Hearing Protection Attenuation."

1910.95(j)(2)

Hearing protectors must attenuate employee exposure at least to an 8-hour time-weighted average of 90 decibels as required by paragraph (b) of this section.

1910.95(j)(3)

For employees who have experienced a standard threshold shift, hearing protectors must attenuate employee exposure to an 8-hour time-weighted average of 85 decibels or below.

1910.95(j)(4)

The adequacy of hearing protector attenuation shall be re-evaluated whenever employee noise exposures increase to the extent that the hearing protectors provided may no longer provide adequate attenuation. The employer shall provide more effective hearing protectors where necessary.

1910.95(k)

"Training program."

1910.95(k)(1)

The employer shall train each employee who is exposed to noise at or above an 8-hour time weighted average of 85 decibels in accordance with the requirements of this section. The employer shall institute a training program and ensure employee participation in the program.

1910.95(k)(2)

The training program shall be repeated annually for each employee included in the hearing conservation program. Information provided in the training program shall be updated to be consistent with changes in protective equipment and work processes.

1910.95(k)(3)

The employer shall ensure that each employee is informed of the following:

1910.95(k)(3)(i)

The effects of noise on hearing;

1910.95(k)(3)(ii)

The purpose of hearing protectors, the advantages, disadvantages, and attenuation of various types, and instructions on selection, fitting, use, and care; and

1910.95(k)(3)(iii)

The purpose of audiometric testing, and an explanation of the test procedures.

1910.95(l)

"Access to information and training materials."

1910.95(l)(1)

The employer shall make available to affected employees or their representatives copies of this standard and shall also post a copy in the workplace.

1910.95(l)(2)

The employer shall provide to affected employees any informational materials pertaining to the standard that are supplied to the employer by the Assistant Secretary.

1910.95(l)(3)

The employer shall provide, upon request, all materials related to the employer's training and education program pertaining to this standard to the Assistant Secretary and the Director.

1910.95(m)

"Recordkeeping" -

1910.95(m)(1)

"Exposure measurements." The employer shall maintain an accurate record of all employee exposure measurements required by paragraph (d) of this section.

1910.95(m)(2)

"Audiometric tests."

1910.95(m)(2)(i)

The employer shall retain all employee audiometric test records obtained pursuant to paragraph (g) of this section:

1910.95(m)(2)(ii)

This record shall include:

1910.95(m)(2)(ii)(A)

Name and job classification of the employee;

1910.95(m)(2)(ii)(B)

Date of the audiogram;

1910.95(m)(2)(ii)(C)

The examiner's name;

1910.95(m)(2)(ii)(D)

Date of the last acoustic or exhaustive calibration of the audiometer; and

1910.95(m)(2)(ii)(E)

Employee's most recent noise exposure assessment.

1910.95(m)(2)(ii)(F)

The employer shall maintain accurate records of the measurements of the background sound pressure levels in audiometric test rooms.

1910.95(m)(3)

"Record retention." The employer shall retain records required in this paragraph (m) for at least the following periods.

1910.95(m)(3)(i)

Noise exposure measurement records shall be retained for two years.

1910.95(m)(3)(ii)

Audiometric test records shall be retained for the duration of the affected employee's employment.

1910.95(m)(4)

"Access to records." All records required by this section shall be provided upon request to employees, former employees, representatives designated by the individual employee, and the Assistant Secretary. The provisions of 29 CFR 1910.1020 (a)-(e) and (g)-

1910.95(m)(4)(i)

apply to access to records under this section.

1910.95(m)(5)

"Transfer of records." If the employer ceases to do business, the employer shall transfer to the successor employer all records required to be maintained by this section, and the successor employer shall retain them for the remainder of the period prescribed in paragraph (m)(3) of this section.

1910.95(n)

"Appendices."

1910.95(n)(1)

Appendices A, B, C, D, and E to this section are incorporated as part of this section and the contents of these appendices are mandatory.

1910.95(n)(2)

Appendices F and G to this section are informational and are not intended to create any additional obligations not otherwise imposed or to detract from any existing obligations.

1910.95(o)

"Exemptions." Paragraphs (c) through (n) of this section shall not apply to employers engaged in oil and gas well drilling and servicing operations.

[39 FR 23502, June 27, 1974, as amended at 46 FR 4161, Jan. 16, 1981; 46 FR 62845, Dec. 29, 1981; 48 FR 9776, Mar. 8, 1983; 48 FR 29687, June 28, 1983; 54 FR 24333, June 7, 1989; 61 FR 5507, Feb. 13, 1996; 61 FR 9227, March 7, 1996; 71 FR 16672, April, 3, 2006; 73 FR 75584, Dec. 12, 2008]