

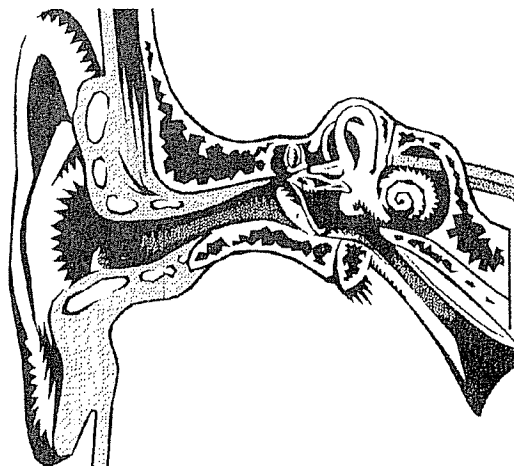


HEARING CONSERVATION

OCCUPATIONAL NOISE EXPOSURE - 1910.95

Background

It is estimated by OSHA (46 FR 4078) that there are 2.9 million workers in American production industries who experience 8-hour noise exposures in excess of 90 dBA. An additional 2.3 million experience exposure levels in excess of 85 dBA. The Hearing Conservation Amendment (HCA) applies to all 5.2 million employees except for those in oil and gas well drilling and service industries, which are specifically exempted. Additionally, the Amendment does not apply to those engaged in construction and agriculture, although a Construction Industry Noise Standard exists (29 CFR 1926.52 and 1926.101). This Standard is identical to paragraphs (a) and (b) of the General Industry Noise Standard, 1910.95.



The Occupational Noise Standard

Prior to promulgation of the HCA, the existing Noise Standard (29 CFR 1910.95(a) and (b)) established a permissible noise exposure level of 90 dBA for 8 hours and required the employer to reduce exposure to that level by use of feasible engineering and administrative controls. In all cases in which sound



levels exceeded the permissible exposure, regardless of the use of hearing-protective devices, "a continuing, effective hearing conservation program" was required. However, the details of such a program were never mandated. Paragraphs (c) through (p) of the HCA replaced paragraph (b)(3) of 29 CFR 1910.95 and supplemented OSHA's definition of an "effective hearing conservation program."



SUMMARY OF THE HCA - 1910.95(c) - (p)

All employees whose noise exposures equal or exceed an 8-hour time-weighted-average (TWA) of 85 dBA must be included in a hearing conservation program comprised of five basic components:

1. Exposure monitoring
2. Audiometric testing
3. Hearing protection
4. Employee training
5. Recordkeeping



Note that although the 8-hour TWA permissible exposure remains 90 dBA, a hearing conservation program becomes mandatory at an 8-hour TWA exposure of 85 dBA.

The remainder of this section discusses the major requirements of OSHA's hearing conservation program.

Monitoring

The HCA requires employers to monitor noise exposure levels in a manner that will accurately identify employees who are subjected to an 8-hour TWA exposure of 85 dBA or more. The exposure measurement must include all noise within an 80 - 130 dBA range. The requirement is performance-oriented and allows employers to choose the monitoring method that best suits each situation.

Employees are entitled to observe monitoring procedures and, in addition, they



must be notified of the results of exposure monitoring. However, the method used to notify employees is left to the discretion of the employer.

Employers must re-monitor workers' exposures whenever changes in exposures are sufficient to require new hearing protectors or whenever employees not previously included in the program because they were not exposed an 8-hour TWA of 85 dBA are included in the program.

Instruments used for monitoring employee exposures must be calibrated to ensure that the measurements are accurate. Since calibration procedures are unique to specific instruments, employers should follow the manufacturer's instructions to determine when and how extensively to calibrate.

Audiometric Testing Program

Audiometric testing not only monitors employee hearing acuity over time but also provides an opportunity for employers to educate employees about their hearing and the need to protect it. The audiometric testing program includes obtaining baseline audiograms and annual audiograms and initiating training and follow-up procedures. The audiometric testing program should indicate whether hearing loss is being prevented by the employer's hearing conservation program. Audiometric testing must be made available to all employees who have an average exposure level of 85 dBA. The program shall be provided at no cost to employees.

A professional (audiologist, otolaryngologist, or physician) must be responsible for the program, but he or she does not have to be present when a qualified technician is actually conducting the testing. Professional responsibilities include overseeing the program and the work of the technicians, reviewing problem audiograms, and determining whether referral is necessary. Either a professional or a trained technician may conduct audiometric testing.



In addition to administering audiometric tests, the tester (or the supervising professional) is also responsible for ensuring that the tests are conducted in an appropriate test environment, for seeing that the audiometer works properly, for reviewing audiograms for standard threshold shifts (as defined in the HCA), and for identifying audiograms that require further evaluation by a professional.

Baseline and Annual Audiograms

There are two types of audiograms required in the hearing conservation program: baseline and annual audiograms. The baseline audiogram is the reference audiogram against which future audiograms are compared. Baseline audiograms must be provided within 6 months of an employee's first exposure at or above a TWA of 85 dBA.

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 this requirement.

Employees shall be notified regarding the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination.

When employers obtain audiograms in mobile test vans, baseline audiograms must be completed within 1 year after an employee's first exposure to workplace noise at or above an average of 85 dBA. Additionally, when mobile vans are used and employers are allowed to delay baseline testing for up to a year, those employees exposed to levels of 85 dBA or more must be issued and fitted with hearing protectors 6 months after initial exposure. The hearing protectors are to be worn until the baseline audiogram is obtained. Baseline audiograms taken before the effective date of the amendment are acceptable as baselines in the program if the professional supervisor determines that the



audiogram is valid. The annual audiogram must be conducted within 1 year of the baseline. It is important to test hearing on an annual basis to identify changes in hearing acuity so that protective follow-up measures can be initiated before hearing loss progresses.

Evaluation of Audiograms

Annual audiograms must be routinely compared to baseline audiograms to determine whether the audiogram is accurate and whether the employee has lost hearing ability; i.e., to determine whether a standard threshold shift, or STS, has occurred. An effective program depends on a uniform definition of an STS. An STS is defined in the amendment as an average shift (or loss) in either ear of 10 dB or more at the 2,000-, 3,000-, and 4,000-Hertz (Hz) frequencies. A method of determining an STS by computing an average was chosen because it diminishes the number of persons identified as having an STS who are later shown not to have had a significant change in hearing ability.

If an STS is identified, the employee must be fitted or refitted with adequate hearing protectors, instructed in how to use them, and required to wear them. In addition, employees must be notified in writing within 21 days from the time the determination is made that their audiometric test results indicate an STS. Some employees with an STS may need to be referred for further testing if the professional determines that their test results are questionable or if they have an ear problem of a medical nature caused or aggravated by wearing hearing protectors. If the suspected medical problem is not thought to be related to wearing protectors, employees must merely be informed that they should see a physician. If subsequent audiometric tests show that the STS identified on a previous audiogram is not persistent, employees exposed to an average level of 90 dBA may discontinue wearing hearing protectors.

A subsequent audiogram may be substituted for the original baseline audiogram



if the professional supervising the program determines that the employee has experienced a persistent STS. The substituted audiogram becomes known as the revised baseline audiogram. This substitution will ensure that the same shift is not repeatedly identified. The professional may also decide to receive the baseline audiogram after an improvement in hearing has occurred, which will ensure that the baseline reflects actual thresholds as much as possible. When a baseline audiogram is revised, the employer must, of course, also retain the original audiogram.

Audiometric Test Requirements

Audiometric tests shall be pure tones, 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.

To obtain valid audiograms, audiometers must be used, maintained, and calibrated according to specifications detailed in appendices C and E of the standard.

Hearing Protectors

Hearing protectors must be made available to all workers exposed to an 8-hour TWA of 85 dBA or more at no cost to the employees. This requirement will ensure that employees have access to protectors before they experience a loss in hearing. When baseline audiograms are delayed because it is inconvenient for mobile test vans to visit the workplace more than once a year, protectors must be worn by employees for any period exceeding 6 months from the time they are first exposed to 8-hour average noise levels of 85 dBA or more until their baseline audiograms are obtained. The use of hearing protectors is also mandatory for employees who have experienced STSs, since these workers are



particularly susceptible to noise.

With the help of a person who is trained in fitting hearing protectors, employees shall be given the opportunity to select their hearing protectors from a suitable variety provided by the employer. The protector selected should be comfortable to wear and offer sufficient attenuation to prevent hearing loss. Employees must be shown how to use and care for their protectors, and they must be supervised on the job to ensure that they continue to wear them correctly. Hearing protectors shall be replaced as necessary.

Hearing protectors must provide adequate attenuation in each employee's work environment. The employer must reevaluate the suitability of the employee's present protector whenever there is a change in working conditions that may render the hearing protector inadequate. If workplace noise levels increase, employees must be given more effective protectors. The protector must reduce the level of exposure to at least 90 dBA or 85 dBA when an STS has occurred.

Training

Employee training is important because when workers understand the hearing conservation program's requirements and why it is necessary to protect their hearing, they will be better motivated to actively participate in the program. Employees will be more willing to cooperate by wearing their protectors and by undergoing audiometric tests. Employees exposed to TWAs of 85 dBA and more must undergo at least annual training in the following:

- Effects of noise
- Purpose, advantages, disadvantages, and attenuation characteristics of various types of hearing protectors



- Selection, fitting, and care of protectors
- Purposes and procedures of audiometric testing

Training does not have to be accomplished in one session. the program may be structured in any format, and different parts may be conducted by different individuals as long as the required topics are covered. For example, audiometric procedures could be discussed immediately prior to audiometric testing. The training requirements are such that employees must be reminded on a yearly basis that noise is hazardous to hearing, and that they can prevent damage by wearing hearing protectors, when appropriate, and by participating in audiometric testing.

Recordkeeping

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

All records required by this section shall be provided upon request to employees, former employees, representatives designated by the individual employee and OSHA.

Summary

The effectiveness of a hearing conservation program depends on the cooperation of employers, supervisors, employees, and others concerned. Management's



responsibility in this type of program includes taking noise measurements, initiating noise control measures, undertaking the audiometric testing of employees, providing hearing-protective equipment where it is required, enforcing the use of such protective equipment with sound policies and by example, informing employees of the benefits to be derived from a hearing conservation program, and providing annual training. Additionally, OSHA requires employers to make available to affected employees or their representatives copies of the OSHA noise standard and also post a copy in the workplace.

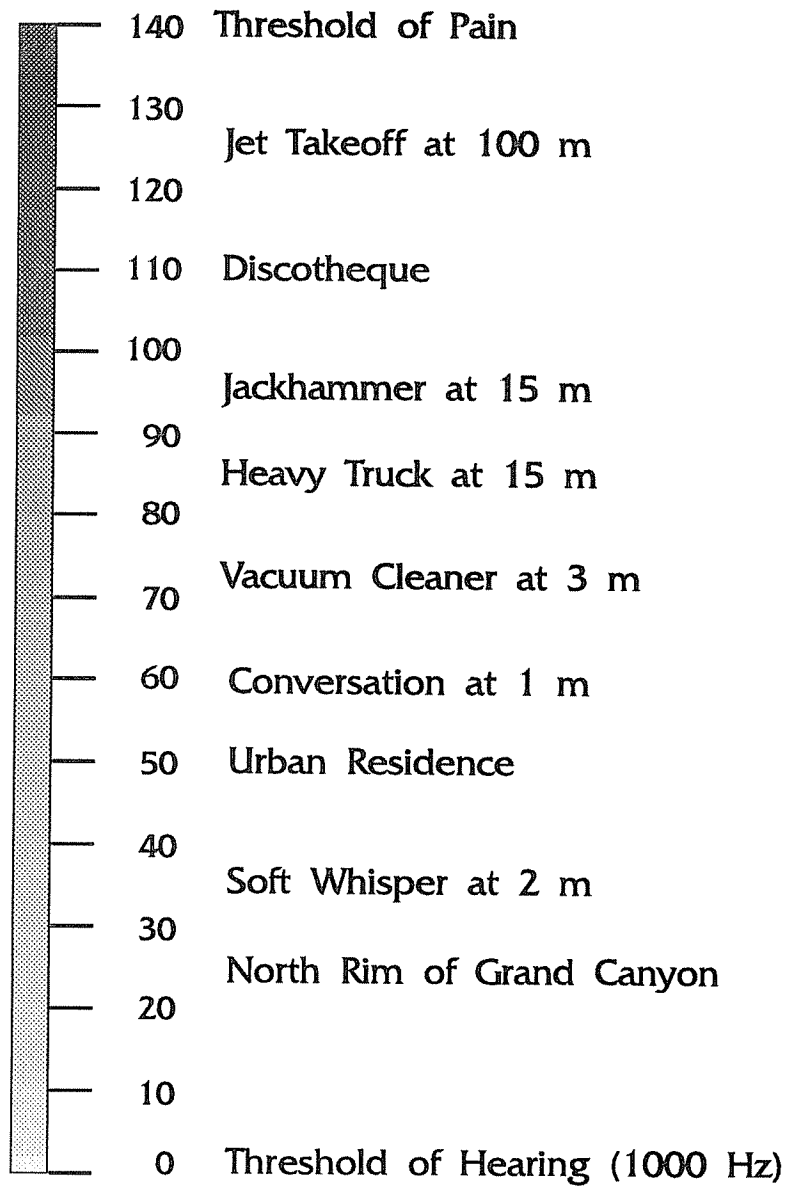
It is the employee's responsibility to make proper use of the protective equipment provided by management. It is also the employee's responsibility to observe any rules or regulations in the use of equipment designed to minimize noise exposure.

Detailed references to noise, its management, effects, and control can be found in a great many books and periodicals. For those employers needing assistance in establishing hearing conservation programs, consultation services are available in a number of professional areas through private consultation, insurance, and governmental groups.



Typical A-WEIGHTED SOUND LEVELS

(dB, RE: 20 MICROPASCALS)



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Hearing Conservation Glossary

Acoustic Trauma. A hearing injury produced by exposure to sudden intense acoustic energy, such as from blasts and explosions or from direct trauma to the head or ear. It should be thought of as one single incident relating to the onset of hearing loss.

Airborne Gap. The difference in decibels between the hearing levels for sound at a particular frequency as determined by air conduction and bone conduction threshold measurements.

Airborne Sound. Sound transmitted through air as a medium.

Air Conduction. The process by which sound is conducted to the inner ear through the air in the outer ear canal utilizing the tympanic membrane (eardrum) and the ossicles as part of the pathway.

Audible. Capable of being heard.

Audible Range. The frequency range over which normal ears hear (approximately 20 Hz through 20,000 Hz).

Audiogram. A chart or table relating hearing level (for pure tones) to frequency. Referred to in OSHA standards as a "pure tone, air conduction, hearing threshold examination."

Audiologist. A person trained in the specialized problems of hearing and deafness.



Audiometer, Pure Tone. An electroacoustical generator that provides pure tones of selected frequencies and of calibrated output, for the purpose of determining an individual's threshold of audibility. OSHA's standard requires testing at frequencies including as a minimum 500, 1000, 2000, 3000, 4000 and 6000 Hz.

Audiometric Reference Level. That sound pressure level (ASA, ISO, or ANSI) to which the audiometer is calibrated. A declared value, at a particular frequency, of the threshold of hearing for normal persons within a given age range, normally 18 to 25 years.

Bone Conduction. The process by which sound is conducted to the inner ear through the cranial bones.

Cycle Per Second (cps). A unit of frequency. The preferred terminology is hertz, abbreviated Hz.

Decibel (dB). A non-dimensional unit used to express sound levels. It is a logarithmic expression of the ratio of a measured quantity to a reference quantity. In audiometry, a level of zero decibels represents roughly the weakest sound that can be heard by a person with good hearing.

Where a weighted network filter is employed in making sound pressure measurements, this is indicated by a suffix added to the unit symbol. For example, a sound-level reading in decibels made on the A-weighted network of a sound level meter is designated as "dBA."

Dosimeter. A device worn on the person for determining the accumulated sound exposure with regard to level and time.

Eustachian Tube. A tube approximately 2-1/2 inches long leading from the



back of the throat to the middle ear. It equalizes the pressure of air in the middle ear with that outside the eardrum.

Hearing Conservation. The prevention or minimizing of noise induced hearing loss through the use of hearing protection devices and the control of noise through engineering methods or administrative procedures.

Hearing Loss. An increase in the threshold of audibility, at specific frequencies, as the result of normal aging, disease, or injury to the hearing organs.

Hearing Threshold Level (HTL). Amount (in decibels) by which the threshold of audibility for that ear exceeds a standard audiometric threshold.

Hertz (Hz). Synonymous term for cycles per second. Hertz is the preferred unit of frequency.

Kilohertz (kHz). 1000 Hz.

Meniere's Disease. The combination of deafness, tinnitus, nausea, and vertigo.

Noise Induced Hearing Loss. This terminology is usually restricted to mean the slowly progressive inner ear hearing loss which results from exposure to noise over a long period of time as contrasted to acoustic trauma or physical injury to the ear.

Ossicles. Any one of the small bones such as the malleus, incus, or stapes which forms a chain for the transmission of sound from the tympanic membrane to the oval window.

Otolaryngologist. A physician or surgeon specializing in the practice of Otology (ear disease), Rhinology (nose disease), and Laryngology (throat and



larynx diseases).

Otologist. A physician or surgeon who specializes in the diagnosis and treatment of the disorders and diseases of the ear.

Presbycusis. Decline in hearing acuity that normally occurs with aging process.

Standard Threshold Shift (STS). Defined in OSHA's hearing conservation regulation as an average shift (or loss) in either ear of 10 dB or more at the 2,000-, 3000-, and 4,000- Hertz (Hz) frequencies.

Temporary Threshold Shift (TTS). The component of threshold shift which shows progressive reduction with the passage of time when the apparent cause has been removed.

Threshold of Hearing of a Continuous Sound. The minimum value of the sound pressure which excites the sensation of hearing.

Threshold of Pain for a Specified Signal. The minimum effective sound pressure level of that signal which, in a specified fraction of the trials, will stimulate the ear to a point at which there is a sensation of pain that is distinct from a feeling of discomfort (usually above 120 dBA).

Tinnitus. A subjective sense of noises in the head or ringing in the ears for which there is no observable external cause.