



U. S. Department of Labor
Occupational Safety and Health Administration
Directorate of Science, Technology & Medicine
Office of Science and Technology Assessment

Hearing Conservation for the Hearing-Impaired Worker

Safety and Health Information Bulletin

SHIB 12-27-2005

Introduction

Hearing-impaired workers face many challenges in the workplace, including communication, identifying and using suitable hearing protection and the use of hearing aids at work. Industrial hearing conservation programs may not fully address the specific needs of hearing-impaired workers for hearing protection and communication. This Safety and Health Information Bulletin (SHIB) focuses on how hearing conservation programs can address the needs of hearing-impaired workers who are exposed to high levels of noise in their workplace. For additional information on workplace accommodations for hearing-impaired workers for emergency preparedness/response and workplace safety in general, please refer to “Innovative Workplace Safety Accommodations for Hearing-Impaired Workers,” SHIB 07-22-2005 at <http://www.osha.gov/dts/shib/shib072205.html>.

Purpose

The purpose of this SHIB is to raise awareness about issues associated with protecting hearing-impaired workers in noisy environments and to provide employers, workers and professional organizations guidance on accommodating hearing-impaired individuals in the workplace when exposed to high levels of noise. Specifically, this SHIB:

1. Informs employers that specialized hearing protectors are available that may benefit occupationally exposed hearing-impaired workers in a variety of noisy workplaces;

This Safety and Health Information Bulletin is **not** a standard or regulation, and it creates no new legal obligations. The Bulletin is advisory in nature, informational in content, and is intended to assist employers in providing a safe and healthful workplace. Pursuant to the *Occupational Safety and Health Act*, employers must comply with hazard-specific safety and health standards promulgated by OSHA or by a state with an OSHA-approved state plan. In addition, pursuant to Section 5(a)(1), the General Duty Clause of the Act, employers must provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm. Employers can be cited for violating the General Duty Clause if there is a recognized hazard and they do not take reasonable steps to prevent or abate the hazard. However, failure to implement any recommendations in this Safety and Health Information Bulletin is not, in itself, a violation of the General Duty Clause. Citations can only be based on standards, regulations, and the General Duty Clause.

2. Encourages employers to work as a team with hearing-impaired workers and the professional in charge of the hearing conservation program to determine the appropriate hearing protection for the hearing-impaired employee, and to determine on a case-by-case basis whether the worker’s hearing aid can be appropriately worn in a noisy workplace under an earmuff;

3. Informs employers and hearing-impaired workers that individualized audiometric testing protocols may be necessary to obtain valid audiograms.

4. Raises awareness about the need to protect the residual hearing of workers with hearing loss.

Hearing Conservation Issues Relating to Hearing-Impaired Workers

Use of Hearing Protection

OSHA's occupational noise exposure standard includes requirements for hearing protection as part of the employer's hearing conservation program (29 CFR 1910.95(i)). It requires employers to make hearing protectors available to all employees exposed to an 8-hour time-weighted average (TWA) sound level of 85 decibels (dBA) or greater. It also requires that hearing protectors be worn by employees exposed to an 8-hour TWA of 85 dBA if they have experienced a standard threshold shift (STS). Hearing protectors are also required to be used prior to receiving a baseline audiogram, and as required by 29 CFR 1910.95(b)(1). Employees must be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors provided by the employer. The employer must ensure proper initial fitting and supervise the correct use of all hearing protectors. The employer must also evaluate the protector's attenuation for the specific noise environments in which the protector will be used.

The use of hearing protection in the workplace is of special concern to workers who already have hearing loss. Hearing-impaired workers can have difficulty hearing co-workers, verbal instructions, the sound of machinery, or they may lack the ability to identify the direction of a sound source. Hearing-impaired workers may experience difficulty in using hearing protectors because conventional hearing protectors may reduce the speech volume level below the person's threshold of audibility, especially for the important middle to higher frequency consonant sounds [3]. Manufacturers are continually designing and upgrading specialized hearing protectors for industrial, military, law enforcement, and fire and rescue team use. These may also benefit

occupationally exposed hearing-impaired workers in a variety of noisy workplaces. Some of these innovative protectors are suitable for the hearing-impaired worker because they provide better clarity for speech recognition and communication, while still providing adequate protection in noisy environments by keeping the sound that reaches the ear at a safe level [1]. As manufacturers respond to the need, a number of affordable hearing protection options are emerging that allow hearing-impaired workers to function safely and effectively in noisy environments without the risk of further hearing loss [2].

Although workers with hearing impairment have lost part of their hearing ability, OSHA 29 CFR 1910.95(c) provides for protection of their residual hearing ability. Even employees who have been diagnosed with severe or profound deafness may have some residual hearing that needs to be protected from additional loss. Therefore, OSHA has taken the position that the requirements for using hearing protection in accordance with 29 CFR 1910.95(b)(1) and 1910.95(i)(2) apply to deaf employees. The Agency has stated that "there is no exception (for hearing protection) for employees who have diminished capacity to hear or for employees who have been diagnosed as deaf." OSHA Letter of Interpretation, Tekla A. Staley, August 3, 2004 http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=24980

Specialized hearing protectors

Specialized hearing protectors include passive (no electronics or amplification), active (a power supply and electronics), or communication headsets.

Passive hearing protectors

Flat or uniform-attenuating hearing protectors use mechanical means to filter the sound and provide nearly equal attenuation across the audible frequency range. In general, the signal sounds more natural, clearer and less distorted than the sound from conventional hearing protectors which often provide greater attenuation in the higher frequencies. When

properly fitted, passive hearing protectors can provide adequate protection and users can hear more clearly and thus feel less isolated on the job. Workers with high frequency hearing losses may find these beneficial [3,4].

Active hearing protectors

“Level dependent” (also known as sound restoration) hearing protectors not only block sound but use electronic circuitry to transmit low-level sounds through the hearing protector. They amplify incoming sounds up to a specified sound level depending on the model and type of hearing protector. Above the specified level, the electronic input is automatically reduced so that the protector no longer provides amplification which could lead to overexposure. An advantage of these protectors is that during quiet time and intermittent noise there is no need to remove the hearing protector to hear well [3,4].

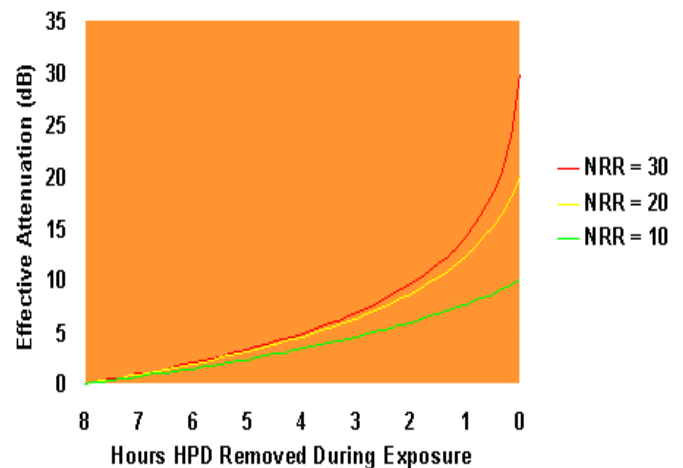
Earmuffs with communication features are also available. These devices are designed with wireless (FM or infrared) or wired technology for one or two-way communication systems. The devices provide specialized electronic circuits to limit the incoming sounds so that the earphones themselves do not create sound levels that are hazardous to the wearer [3,4].

In extremely high noise levels, dual hearing protection (such as an earplug under an earmuff) equipped with electronic/communication features may permit clearer communication without sacrificing attenuation. [3].

For more information on available hearing protectors, the National Institute for Occupational Safety and Health (NIOSH) has an online compendium of hearing protection devices. The listing is provided at <http://www.cdc.gov/niosh/topics/noise>. Additionally, the U.S. Department of Labor’s Office of Disability Employment Policy Technical Assistance Program’s Job Accommodation Network (JAN) has a Searchable Online Accommodation Resource (SOAR) feature that lists hearing protector manufacturers that have provided information to that network. Neither OSHA nor JAN recommends or endorses any company’s products. However, JAN

has valuable information on the availability of specific hearing protectors for use with the hearing-impaired population. The listing is provided at <http://www.jan.wvu.edu/cgi-win/OrgQuery.exe?Sol541>.

Many workers have strong preferences for a particular type of hearing protector because of comfort, fit, and communication demands. Experience has shown that the effectiveness of hearing protection is diminished if it is removed for even a short period of time [3,11]. Therefore, comfort, communication, and hearing protectors that allow for necessary job-related hearing is key to their preventive effect and the actual protection received [3]. The right hearing protector is one that is consistently worn. The graph below depicts the relationship between effective hearing protection attenuation and the amount of time hearing protection is worn.



[11].

Selecting and Fitting Hearing Protection Devices

29 CFR 1910.95(i)(3) states that “employees shall be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors provided by the employer.” The phrase “suitable hearing protectors” has been interpreted to mean protectors that are comfortable to wear and that offer sufficient attenuation to prevent hearing loss. OSHA Letter of Interpretation, Danny D. Anderson, September 30, 1983 http://www.osha.gov/pls/oshaweb/owadispshow_document.pl?table=INTERPRETATIONS&p_id=19149

In general, “employers are advised to give workers a choice between at least one type of earplug and one type of muff; . . . the number of different hearing protectors required to constitute an adequate variety is simply the number needed to supply each employee that requires a hearing protector a suitable one.” OSHA Letter of Interpretation, G.A. Brown, October 17, 1983 http://www.osha.gov/pls/oshaweb/owadispshow_document?p_table=INTERPRETATIONS&p_id=19154

To motivate workers to consistently wear hearing protectors in noisy situations, employers should engage workers in determining their individual hearing protector needs. An employer should also consider referring a worker with a hearing impairment for a one-on-one consultation with a qualified hearing conservation professional to determine the most suitable hearing protector for the particular working environment. Important considerations for selecting the appropriate hearing protector include the worker’s hearing and noise exposure levels, job assignment, job-related hearing requirements, communication requirements and environmental considerations. The chosen hearing protector must provide the needed amount of attenuation specific to each worker’s noise exposure situation. Over attenuation (blocking too much sound) can produce undesirable and unnecessary interference with speech and warning signals [5].

More information on the selection of hearing protectors and OSHA’s requirements for a hearing conservation program can be found on the OSHA website at <http://www.osha.gov>. The website will direct you to standards, letters of interpretation, technical guidance documents and informational pamphlets. NIOSH also has a wide variety of information on noise and hearing loss and has a dedicated website for Noise and Hearing Loss Prevention at <http://www.cdc.gov/niosh/topics/noise>.

Hearing Aid Usage in Industry

Some hearing-impaired workers who wear hearing aids want to be able to continue to wear hearing aids in their workplaces even when exposed to high levels of noise. They feel that with the hearing aid they can

communicate better with co-workers, are able to better localize sound, and can hear warning or equipment sounds. Hearing aids, however, in addition to amplifying useful sounds also amplify unwanted background noise [4]. As demonstrated in both laboratory and site measurements, noise amplified by hearing aids may exceed the OSHA 8-hour permissible limit of 90 dBA [6,7].

Consequently, hearing aids should not be worn in areas with hazardous noise [2,6,7]. However, on a case-by-case basis, hearing aids can be worn underneath an earmuff [7,12]. The hearing conservation professional, overseeing the hearing conservation program should be consulted to evaluate and manage these situations on a case-by-case basis to ensure no further change in hearing occurs.

Workers have suggested that they want to wear their hearing aids at work in the turned-off position in lieu of using hearing protection since they are accustomed to their own earmolds, and the hearing aid is already in their ear. Hearing aids are not hearing protectors. Hearing aids turned off do not provide enough blockage of sound to act as hearing protection, but may reduce the sound enough to prevent the worker from hearing warning signals or other essential sounds [2]. OSHA has stated that employees with “a diminished capacity to hear cannot satisfy the requirement to wear hearing protection simply by turning off their hearing aids when working in a high noise area. Hearing aids are not hearing protectors.” OSHA Letter of Interpretation, Tekla A. Staley, August 3, 2004 http://www.osha.gov/pls/oshaweb/owadispshow_document?p_table=INTERPRETATIONS&p_id=24980.

Individual evaluation by a qualified occupational hearing conservation professional and following-up with the employee at the worksite will ascertain the suitability of the hearing aid and/or hearing protector for that particular employee’s noise environment.

Audiometric Testing Requirements

For the purpose of determining whether an employee has a standard threshold shift (STS), the hearing-impaired employee must remove his/her hearing aid

and be tested with the appropriate headphones and procedures specified in the hearing conservation standard, 29 CFR 1910.95(h)(1)-(h)(5); audiometric test requirements. Considerations for testing hearing-impaired employees may include switching from an automatic testing technique (with a microprocessor audiometer) to a manual technique to obtain valid thresholds. This may be necessary due to the degree of hearing loss or other confounding factors such as ringing in the ears. Also, “employees with hearing aids should keep the aids on during the audiometric test instructions”, and, “hearing aids should, of course, be removed after the instructions have been given” [5]. Some hearing-impaired workers may need to be referred for further evaluation and testing if a valid audiogram can not be obtained on-site [5].

The correct approach to address these challenges will depend on facts specific to each individual situation, and should be resolved by collaborative teamwork involving the employer, the hearing-impaired employee and the hearing conservation professional [6,7].

Conclusion

The recommendations provided in this bulletin offer guidance on addressing the special needs of hearing-impaired workers to protect their hearing in high noise environments.

The risk of miscommunication, injury, and other challenges presented to the hearing-impaired employee in the workplace can be minimized through the implementation of certain practical steps. These include but are not limited to:

- awareness that hearing-impaired workers may have special needs to protect their hearing,
- providing information,
- soliciting input,

- providing choices,
- team collaboration to ascertain individual workplace needs, and
- referral for further evaluation, as appropriate.

References

- 1) Hearing Health, “Future for Workers?”. Lee Hager, Fall 2003.
- 2) Workers’ Compensation Board of British Columbia, WorkSafe, “Working with Hearing Loss--Hearing Impairment, Noise, and Job Safety/Performance”, May 29, 2003.
- 3) The Noise Manual, Fifth Edition, Chapter 10, Hearing Protection Devices, Elliott Berger, May 2000, AIHA, Fairfax, Va.
- 4) Encyclopedia of Acoustics, “Hearing Protection Devices”, ISBN 0-471-80465-7, 1997 John Wiley & Sons, Inc., and the 2004 TeleWeb Virtual Seminar Series, New Developments in Hearing Protection, with an Update on Ratings and Specialized Types of HPDs, July 27, 2004, Elliott Berger.
- 5) Council for Accreditation in Occupational Hearing Conservation (CAOHC) Manual, Chapters 7, The Audiometric Testing Program, Chapter 8, Understanding the Audiogram and Follow-Up Procedures, and chapter 10, Hearing Protectors.
- 6) Journal of Speech and Hearing Research, “Noise Exposure Associated with Hearing Aid Use in Industry”. Thomas Dolan and James Maurer. Volume 39, 251-260, April 1996.
- 7) Occupational Health and Safety, “Hearing Aids in Occupational Settings: Safety and Management Issues”. Thomas Dolan and James Maurer. October 2000.
- 8) EARLog #18, “Can Hearing Aids Provide Hearing Protection?” Elliott Berger, E-A-R, Indianapolis, Ind.

9) Responses to NHCA/OSHA Alliance Questionnaire on Application of Accommodations to hearing conservation practices.

10) U.S. Department of Labor/OSHA.
<http://www.osha.gov>.

11) <http://www.michaelassociates.com>

12) National Hearing Conservation Association, comments provided.

For educational information on hearing conservation, visit E-A-R Hearing Conservation, <http://www.e-a-r.com/hearingconservation>

The Better Hearing Institute,
<http://www.betterhearing.org/research/factoids.cfm>

For information on innovations in technology and hearing conservation, you may visit Hearing Products Report. The web address is: <http://www.hearingproductsreport.com/departments.ASP?Dept=H0509II>.

Other Useful Resources

The Office of Disability Employment Policy offers the following technical assistance programs: Training and Technical Assistance to Providers (T-TAP) <http://www.t-tap.org>. The National Center on Workforce and Disability for Adults <http://www.onestops.info/>, and the National Collaborative on Workforce and Disability for Youth (NCWD/Youth) <http://www.ncwd-youth.info/>.

Job Accommodation Network's Searchable Online Accommodation Resource, (SOAR) for Hearing Protectors <http://www.jan.wvu.edu/cgi-win/OrgQuery.exe?Sol541>

The National Hearing Conservation Association, (NHCA) http://www.hearingconservation.org/as_aboutHearingCons.html

The American Academy of Audiology, (AAA) <http://www.audiology.org/consumer/>
American Speech-Language-Hearing Association, (ASHA) <http://www.asha.org/public/>

National Institute for Occupational Safety and Health, (NIOSH) <http://www.cdc.gov/niosh/topics/noise>

National Institute on Deafness and Other Communication Disorders, (NIDCD) Wise Ears campaign- <http://www.nidcd.nih.gov>