



Hearing & Noise

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Plugging the Knowledge Gap in Hearing Protection

By: Tim Turney, Contributor

Approximately 22 million workers are exposed to hazardous occupational noise each year¹. Prolonged exposure to excessive noise levels can cause life-changing damage, because the harm to the sensory cells and other structures within the ears is irreversible—often resulting in permanent noise-induced hearing loss (NIHL).

NIHL is more common than diabetes or cancer². It results in injuries that can seriously impair a worker's quality of life. Employers, meanwhile, run the risk of reduced productivity; rising costs due to sickness days; increased costs for training and recruitment; and catastrophic penalties and compensation claims. OSHA estimates that employers spend \$242 million annually on workers' compensation for hearing loss disability³.

Understanding Legal Requirements

To keep workers safe, OSHA sets the legal limits on noise exposure in the workplace based on a worker's time-weighted average over an 8-hour day. OSHA's maximum permissible exposure limit to noise is 90dBA (decibels) for all workers. When workers are exposed to an average noise level of 85dBA or higher for an 8-hour shift, employers must implement a hearing conservation program. These programs require employers to measure noise levels, provide free annual hearing exams and hearing protection, offer training and conduct evaluations of the adequacy of the hearing protectors in use.

The programs cost around \$350 per worker each year⁴, necessitating \$70,000 annually for a 200-strong workforce. They are mandatory until the employer makes sufficient changes to the tools, equipment and schedules used, so that conditions are improved, and worker exposure is demonstrated to be less than the 85dBA.

Conversely, the National Institute for Occupational Safety and Health (NIOSH) recommends that all worker exposure

to noise should be controlled below or equivalent to the level 85dBA for 8 hours, a decibel level comparable to the sound of a passing diesel truck. NIOSH designed its recommendations to represent the best scientific practice concerning noise exposure. On the other hand, the OSHA exposure limit is the minimum legal requirement with which employers must comply.

Using Noise Monitoring to Gather Accurate Insights

Noise monitoring provides accurate insights into the noise levels of a working environment, so businesses can identify problem areas and ensure they adhere to OSHA regulations. However, professionals undertaking the monitoring should be trained and prepared sufficiently with the right equipment, as minor errors in noise level estimates can lead to major errors in exposure calculations. Inaccurate estimates can risk employee health, employer prosecution and unnecessary expenses undertaking exposure-limiting measures based on inaccurate data.

Two pieces of equipment essential for the assessment are the sound level meter, primarily designed as a hand-held device used by an operator; and the noise dosimeter, which a staff member wears for their working shift. A sound level meter is an ideal solution for measuring the overall noise level of a task, piece of machinery or area. On the other hand, dosimeters, which are smaller and body-mounted, are best for personal noise measurements where it is difficult or unsafe to get close to employees with a sound-level meter. For example, a dosimeter would be ideal for forklift truck drivers exposed to many different noise levels and irregular working patterns.

If an assessment establishes that noise levels pose a risk to workers, personal hearing protection should be supplied immediately—while other, more permanent solutions are



If certain aspects of noise monitoring, protection and control are outside of a company's competencies, it is advisable to seek external consultancies, training and support in order to bridge knowledge gaps and ensure employees get critical protection. (photo courtesy Casella)

executed. However, personal hearing protection should only be considered the primary solution when all other options have been exhausted, such as physically separating staff from the noisiest areas or rotating shifts to spread individual exposure.

A noise survey will determine which employees need personal hearing protection, based on whether:

- The employee is exposed to workplace noise during an 8-hour work shift, in which the noise averages 85dBA (50% dose) or greater
- An employee has not yet had a baseline audiogram established in a work environment averaging 85dBA or greater
- An employee has experienced a standard threshold shift

Occupational standards specify a maximum allowable daily noise dose, expressed in percentages. For example, a person exposed to 85dBA per NIOSH REL or 90dBA per OSHA PEL over an 8-hour work shift will reach 100% of their daily noise dose. The noise dose is based on the sound exposure level and duration, so for each increase of 3-dB (NIOSH) or 5-dB (OSHA) in noise levels, the duration of the exposure should be cut in half.

Relationship Between Sound Exposure Levels & Durations (for NIOSH, OSHA)

Time to reach 100% noise dose	Exposure level per NIOSH REL	Exposure level per OSHA PEL
8 hours	85dBA	90dBA
4 hours	88dBA	95dBA
2 hours	91dBA	100dBA
1 hour	94dBA	105dBA
30 minutes	97dBA	110dBA
15 minutes	100dBA	115dBA

Source: Centers for Disease Control and Prevention⁵

Selecting Personal Hearing Protection

When selecting hearing protection equipment, employers should consider the relationship between hearing protection

and other personal protective equipment (PPE). For example, an employee wearing prescription or safety glasses will not obtain an adequate fit from a standard earmuff, so plugs or semi-inserts may be more suitable. In working environments where hard hats are worn regularly, a hard hat with built-in hearing defenders should be considered.

Employers must also understand the process of reducing sound, known as attenuation. If a protector with too little attenuation is used, then employees will not receive enough protection. However, too much noise reduction can create feelings of isolation, and an employee may need to remove their PPE to communicate.

In addition, over-attenuation can cut out safety warnings—such as fire alarms or sirens from reversing vehicles—resulting in further risks to workers. As a general rule of thumb, businesses can avoid over-protecting workers by ensuring the level of exposure is not reduced to a level below 75dBA.

A business's unique working environment also impacts the best protector choice. For example, hot humid conditions can make earmuffs uncomfortable to wear, while dusty environments can cause hygiene problems. In dusty workplaces, it is crucial to keep the hands clean when inserting protective plugs to avoid ear infections. It is also advisable to ascertain any history of ear problems (i.e., irritation or earache) from employees, as earmuffs that fit over the outer ear may be preferable to avoid medical complications.

Removing PPE, even for short periods, has a significant effect on exposure. Therefore, it is crucial that hearing protection is comfortable. Providing employees with a choice of protection will encourage all-day wear and, ultimately, support their safety.

Keeping the Future Workforce Safe

Employers have a responsibility to prevent damage to their workers' health; however, skill and knowledge of measuring

noise can take years to build. Therefore, the information above can only be considered a foundational introduction. If certain aspects of noise monitoring, protection and control are outside of an individual's competencies, it is advisable to seek external consultancies, training and support in order to bridge knowledge gaps and ensure employees get the critical protection. IHW

About the Author

Tim Turney is Global Marketing Manager at Casella. He graduated as an engineer from Queen Mary and Westfield in London. Since starting at Casella in 1998, Tim has been involved in the acoustics and air-sampling industry, specializing in measurement and instrumentation technologies. Casella is dedicated to reducing occupational health and environmental risks and supporting businesses in solving their monitoring and analysis needs. For more information about Casella's noise monitoring solutions visit, <https://www.casellasolutions.com/us/en.html>.

Footnotes:

1. <https://hearingimprovementcenter.com/hearing-healthcare-news/cdc-finds-hearing-loss-is-third-most-common-chronic-condition>
2. <https://hearingimprovementcenter.com/hearing-healthcare-news/cdc-finds-hearing-loss-is-third-most-common-chronic-condition>
3. <https://www.starkey.com/blog/articles/2019/03/Exposure-to-too-much-noise>
4. [https://pubmed.ncbi.nlm.nih.gov/29251690/#:~:text=Hearing%20conservation%20programs%20\(HCPs\)%20mandated,about%20%24350%2Fworker%2Fyear](https://pubmed.ncbi.nlm.nih.gov/29251690/#:~:text=Hearing%20conservation%20programs%20(HCPs)%20mandated,about%20%24350%2Fworker%2Fyear)
5. <https://www.cdc.gov/niosh/topics/noise/reducenoiseexposure/regsguidance.html>

Age "Correction" in Hearing Conservation Programs

By: Gregory A. Flamme and Kristy K. Deiters, Contributors

Employers may elect to adjust observed hearing threshold changes as an attempt to account for typical age-related change. However, there is no guarantee that age "correction" correctly represents the influence of age, and adjusted threshold shifts are not interpretable for individuals or small groups—because age-related changes vary widely across people. Further, age adjustments are only valid if they represent longitudinal trends.

Age-adjustment tables currently included in U.S. regulations are based on differences between small groups of people in the 1970s. Thus, employers choosing to age-adjust audiograms are making an implicit assumption that 1970s cross-sectional trends represent current age-related changes. Employers should carefully consider whether this assumption is reasonable.

We have recently developed age-adjustment tables using nationally representative data and validated them using a large occupational hearing conservation database (Flamme et al., 2019). These tables represent current population trends; account for differences in race/ethnicity; span ages 18 to 85 years; and match (within one 5dB audiometric step) median longitudinal changes among male workers through 30 years on the job.

Shallower cross-sectional trends were observed for people identifying with non-Hispanic Black race/ethnicity, and overall trends imply substantially less age-related change in hearing thresholds than is assumed in current U.S. regulations [see chart]. Employers applying 1970s-based age adjustments will substantially overestimate current age-related effects, and threshold shifts due to other factors (e.g., occupational/non-occupational exposure, disease) would be missed.

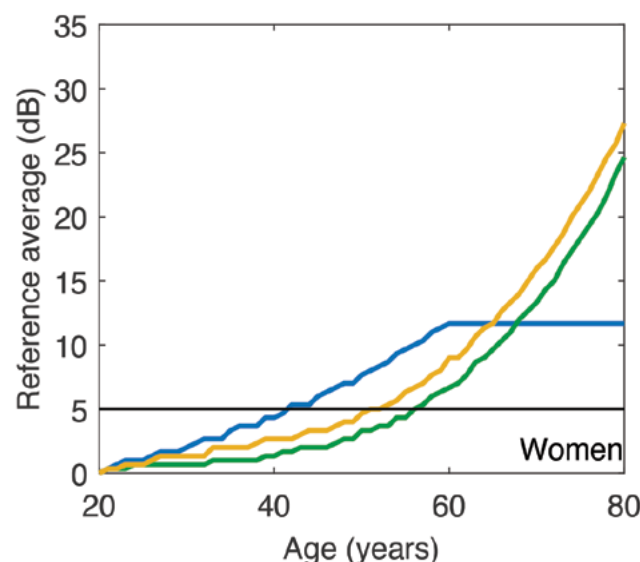
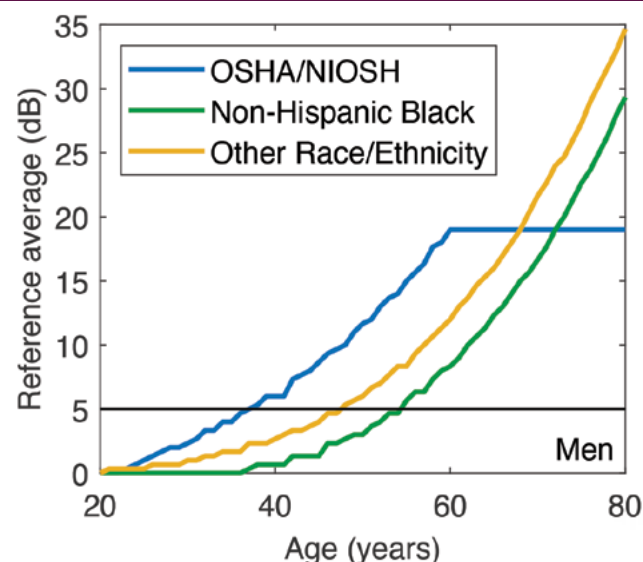


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Regulations have not been modified to include recent adjustment tables, so employers must either (1) use tables that do not represent current trends; or (2) forego age adjustment. NIOSH has advised against using age "corrections" for decades and recent findings support that advice. **IHW**

[Gregory A. Flamme and Kristy K. Deiters, are with Stephenson & Stephenson Research & Consulting Researchers are also and National Hearing Conservation Association (NHCA) Experts. Visit NHCA at: <https://www.hearingconservation.org/>]

COMPARISON OF AGE ADJUSTMENT VALUES



The left plot represents data for men; the right plot represents data for women. In each plot, the horizontal axis represents age and the vertical axis represents the mean tabled values across 2k 3k and 4k Hz, shifted to be equal at age 20. The blue curves represent the OSHA/NIOSH curves referenced in U.S. regulations. The green curves were derived for people reporting non-Hispanic Black race/ethnicity. The yellow curves were derived for people reporting any other race/ethnicity. The horizontal black lines at 5dB provide a reference comparison for an average of one 5dB audiometric step. Chart reference: Flamme, G. A., Deiters, K. K., Stephenson, M. R., Themann, C. L., Murphy, W. J., Byrne, D. C., Goldfarb, D. G., Zeig-Owens, R., Hall, C. Prezant, D. J., & Cone, J. E. (2019). Population-based age adjustment tables for use in occupational hearing conservation programs. *International Journal of Audiology*, 59(S1), S20-S30.

Now Hear This: Right Steps for Hearing Conservation Training

By: Dr. Vickie Tuten and Dr. Kathy Gates, Contributors

Hear, hear! Industrial hygienists serve key roles in providing education and training, one of the essential elements of a Hearing Conservation Program (HCP). Consistent delivery of effective education can have a positive impact on influencing workers to voluntarily adopt behaviors that preserve their sense of hearing.

The Occupational Noise Exposure mandate (OSHA's 29 CFR 1910.95) requires employees exposed to 85dBA TWA be enrolled in the HCP. Employers are required to ensure employees participate in hearing conservation training for the duration of their employment. This should begin with initial orientation training, followed by annual reinforcement.

We will cover the mandates of 29 CFR 1910.95 and specifically highlight the who, when, what and how.

Who: All employees exposed to 85 dBA TWA, for even one day, need to be enrolled in the HCP. 85 dBA TWA is referred to as the action level (AL) under OSHA. The program must have, at a minimum, annual testing, annual training and available hearing protection to enrolled employees. When employees reach the Permissible Exposure Limit (PEL) of 90 dBA TWA, hearing protection is mandated. Annual education and training remain a constant throughout, once the AL is reached.

When: HCP training must be completed annually, and employers must ensure employee participation. The education and training element allows flexibility for the employer to provide the training at different times throughout the year, by any HCP team member. There is not a requirement to discuss all mandated education and training topics in a single event; however, the mandatory topics need to be covered and employee attendance rosters maintained.

What: 29 CFR 1910.95 includes specific guidance as to what topic areas must be covered annually. The required topics can be broken into three "buckets" of information to include the following:

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

Some industries are covered by regulations outside of the general industry standard covered by 29 CFR 1910.95. If your industry is covered by another federal regulation, please consult those regulations for specifics related to this HCP elements. Several resources are listed below:

- MSHA's 30 CFR Part 62, 62.180 (VOLUME III - 30 CFR PARTS 40 THROUGH 50 AND PARTS 62 and 100 | Mine Safety and Health Administration (MSHA)
- FRA's 49 CFR 227.119 (49 CFR 227.119 - Training program. (govregs.com))

How: As an industrial hygienist, you are well-positioned to provide both formal training, as well as informal or impromptu education, when conducting area monitoring or dosimetry. Formal training should always be documented and records maintained in event of an audit. Informal or impromptu education serves as great reinforcement to remind workers of the importance of adopting good hearing conservation practices.

The training element is flexible and allows for creativity to be incorporated into the process. When you break the topics into the three buckets of information, the primary focus



of the industrial hygienist would be to provide training on the "effects of noise on hearing" and "all things hearing protection."

The third required topic, "purpose of audiometric testing and explanation of test procedures," should be provided by the hearing technician at the time of the hearing test.

The topic "effects of noise on hearing" can be delivered at any time. This could be covered during a formal training session or shared with workers while visiting individual worksites. The informal education session is an excellent opportunity to discuss the noise hazards being heard in participants' workplaces; how unprotected exposures to this noise hazard may result in a permanent injury/illness; and how properly worn hearing protection can mitigate the risk of a permanent hearing loss.

Effective messaging will positively influence behavioral change. Showing an image of a healthy cochlea and one damaged from noise will make the injury something the employee



Visual aids can be particularly helpful in helping convey the damaging effects of unprotected noise exposure. (photo courtesy NHSA)

can visualize. Education and training on the effects of hazardous noise exposure should include both auditory effects (e.g., noise-induced hearing loss, tinnitus, hyperacusis) and non-auditory effects (e.g., hypertension, stress, depression, etc.). Visual aids can be particularly helpful in helping convey the damaging effects of unprotected noise exposure.

Covering “all things hearing protection” is a critical part of the orientation and annual education provided to employees. Industrial hygienists are well-suited to take on a major role in educating employees about hearing protection. This might start with their role in noise measurements and noise control; determining which employees may be enrolled; what their exposures are; and how much attenuation is required to adequately protect the employee.

An emerging best practice is Hearing Protection Device (HPD) Fit Testing and a role well-suited to the industrial hygienist. HPD Fit Testing, regardless of method utilized, results in a Personal Attenuation Rating (PAR) for the employee, obtained while wearing the hearing protection device with which they have been fit. The HPD Fit Test can reinforce training by providing immediate feedback to the employee on how well they inserted their hearing protection. This PAR eliminates any guesswork on attenuation achieved with the hearing protection worn by that employee. The report can then be maintained in the employee’s records.

value, however, in gaining voluntary compliance. Effective messaging can convince the employee that the benefits outweigh the inconvenience of hearing protection. That voluntary compliance is more likely to ensure the use of hearing protection continues with off-duty noise exposures, as well.

An employee needs to understand that unprotected exposures to hazardous noise, regardless of where that exposure occurs, can result in a life-altering, permanent hearing loss with many associated negative auditory and non-auditory effects. They also need to understand that when they cannot move away from the hazardous noise source, or turn down the volume, the only course of action that can change the outcome is the proper use of PPE.

There are several hearing conservation resources available to help inform and educate workers about hazardous noise and the importance of wearing hearing protection. Infographics are another great way to explain hazardous noise levels.

At the end of this article are some sources with useful information about hazardous noise and hearing protection. Check them out to help prepare and package your messages about hazardous noise and use of hearing protection. Your one-on-one discussions with workers while visiting worksites can have a positive impact on the prevention of noise-induced hearing loss. As an industrial hygienist, you definitely have a role in saving hearing, one ear at a time. **IHW**

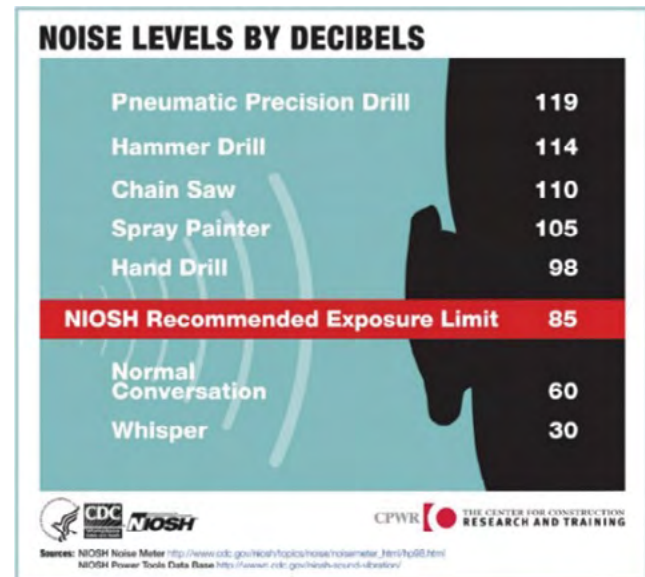
Repeated non-compliance with the mandatory wear of hearing protection should be documented, and reasonable disciplinary action taken as a last resort, in keeping with employer’s policies. There is real

About the Authors

Dr. Vickie Tuten and Dr. Kathy Gates are both AuD audiologists. Dr. Gates works for the DOD HCE, as a contractor, zCore Business Solutions, Inc. Dr. Tuten is an independent contractor with Occupational Marketing, Inc., where she teaches CAOHC courses. Both were also military audiologists.

Additional Resources:

- Noise and Hearing Loss Prevention | NIOSH | CDC
- Listen Up! Protect Your Hearing (infographic) | NIDCD (nih.gov)
- DoD Hearing Center of Excellence
- Hearing Loss (cdc.gov)



This infographic is a great way to explain hazardous noise levels. (Source: NIOSH Noise Meter)

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Protect Your Workforce Against Noise-Induced Hearing Loss

By: Steve Ochs, Contributor

An estimated 22 million workers are exposed to potentially damaging noise at work each year.¹ For employers, worker exposure to noise could result in catastrophic penalties and compensation for hearing loss disability.

The Occupational Safety and Health Administration (OSHA) claims that “an estimated \$242 million is spent annually on workers’ compensation for hearing loss disability,” with noise-induced hearing loss (NIHL) affecting nearly one in four adults in the U.S.²



Monitoring solutions, like hand-held sound level meters and noise dosimeters, are an ideal way to comply with government standards and protect to your workforce. (photo courtesy Casella)

Employer Responsibility

NIHL is preventable, but the effect is permanent, resulting in life-changing injuries that can seriously impair a worker’s quality of life. Thousands of construction workers suffer hearing loss from excessive noise exposure on the job every year. According to a study spanning a decade of research, construction accounted for the second-highest prevalence of workers with a hearing impairment, with at least one in five self-reporting hearing trouble.³

Despite having a duty of care to protect employees from workplace hazards that can cause injury or illness, employers have no obligation to test workers’ hearing (audiometric testing) in construction, even if noise exposure levels exceed OSHA’s Permissible Exposure Limit (PEL).⁴ For this reason, hearing loss is rarely recognized as an “occupational disease” in construction. The Bureau of Labor Statistics (BLS) reports that hearing loss is underreported due to this fact and, for this reason, hearing loss data for the construction sector is not comparable with data for general industry.⁵

However, the repercussions to the employer, if they do not seriously consider the auditory welfare of their workforce, can be significant, leading to huge pay outs in compensation benefits to employees.

Why Monitor for Noise Exposure

OSHA sets the legal limits on noise exposure in the workplace based on a worker’s time-weighted average over an 8-hour day. OSHA’s maximum permissible exposure limit to noise is 90dBA (decibels) for all workers for an 8-hour day, minimizing the risk of occupational noise-induced hearing loss. Conversely, the National Institute for Occupational Safety and Health (NIOSH) recommends that all worker exposure to noise should be controlled below or equivalent to the level 85dBA Recommended Exposure Limit (REL) for 8 hours. Although NIOSH recommendations are designed to represent best scientific practice concerning noise exposure, the OSHA exposure limit is regulatory and the law with which companies must comply.

In 1981, OSHA introduced a new regulation requiring employers to implement a hearing conservation program for workers that are exposed to an average noise level of 85dBA or higher for an 8-hour shift. Hearing Conservation Programs require employers to measure noise levels; provide free annual hearing exams and hearing protection; provide training; and conduct evaluations of the adequacy of the hearing protectors in use—unless the employer makes sufficient changes to tools, equipment and schedules so that conditions are less noisy and worker exposure is less than the 85dBA.

To ensure you adhere to OSHA regulations, monitoring provides accurate insights into the noise levels of a working environment, identifying where the problem areas are. There are many monitoring devices on the market, but it can be difficult to identify what type of product is most suitable for your working environment and where training is required. A successful noise-monitoring program can be carried out

1 <https://www.osha.gov/SLTC/noisehearingconservation/>

2 <https://www.aiha.org/publications-and-resources/TheSynergist/Industry%20News/Pages/Report-Suggests-Nearly-One-in-Four-Americans-Has-Noise-Induced-Hearing-Loss.aspx>

3 <https://www.cpwrr.com/sites/default/files/publications/CB%20page%2049.pdf>

4 <https://www.osha.gov/Publications/osha3074.pdf>

5 <https://www.osha.gov/Publications/osha3074.pdf>



Noise dosimeters are small, body-mounted devices that collect individual exposure data, typically worn during an employee's entire shift. (photo courtesy Casella)

on-site, by trained health and safety managers, using either a sound level meter or a dosimeter.

How to: Sound Level Meters

A sound level meter is a hand-held device, enabling measurements to be taken at the ear with the instrument pointing at the noise source. This process must be repeated for both ears, for all duties employees perform, making it possible to calculate an accurate record of daily exposure. Settings on these meters can be adjusted according to the type of noise being assessed.

When using a sound level meter, measurements must be started at the beginning of a task, representing workers' actual exposure. If workers are likely to be exposed to high levels of impulsive noise, emitted from heavy pressing operations or sheet metal working, peak noises must be measured for accurate results and compared to peak action levels.

If individual working patterns are irregular; if the worker is highly mobile; or if the work carried out means it is not practical or safe to conduct noise monitoring with a sound level meter, noise dosimeters can be used. These are small, body-mounted devices that collect individual exposure data.

Dosimeters are worn by employees for their entire working shift. Data is logged instantly and, when downloaded onto another device, details the time history of the noise exposure, highlighting where high exposures occur throughout the day. Workers can also make a diary of times and jobs performed, allowing the employer to see the operations that require more effective noise controls.

Protecting the Future Workforce Through Noise Monitoring

The statistic regarding workers in the U.S. exposed to potentially damaging noise at work each year is concerning. What is equally concerning is some employers' disregard of NIHL as an occupational disease—particularly in construction—where it poses a major risk. Employers have a crucial

responsibility to protect workers' health from being damaged and to upskill their workforce, so they realize the implications of damaging noise exposure. Monitoring solutions, like hand-held sound level meters and noise dosimeters, are an ideal solution for you and your organization to achieve compliance with government standards and protect to your workforce effectively and demonstrably. **IHW**

About the Author:

Steve Ochs is Casella's (U.S.) Area Business Manager supporting Casella's Health Safety and Environmental boundary monitoring solutions. He assists in the reduction of workplace and environmental health exposures through the supply of effective monitoring solutions for noise and dust. Casella is dedicated to reducing occupational health and environmental risks, and supporting businesses in solving their monitoring and analysis needs. For more information about Casella's noise monitoring solutions visit, www.casellasolutions.com. To find out more about Casella, please visit www.casellasolutions.com/us/en, featuring live chat, or follow @Casella_USA on Twitter, LinkedIn Casella USA or Facebook Casella USA.



To ensure adherence to OSHA regulations, monitoring provides accurate insights into the noise levels of a working environment, identifying where the problem areas are. (photo courtesy Casella)

Improving Noise Safety on Worksites

By: Heather Perl, Contributor

Despite being a serious potential health hazard, loud noises are often not given enough consideration when trying to establish the safety of a worksite. Loud noises are invisible dangers; they may not be immediately obvious, and many employees and employers don't realize how much damage occurs over time. Even moderately loud noises can cause permanent hearing loss eventually, which means a reduction in exposure is necessary.

The Dangers of Loud Noises

Some 24% of adults from ages 20-69 show some level of noise-induced hearing loss. Meanwhile, it's believed that 30 million Americans may be exposed to dangerous levels of noise during their work. When hearing loss occurs, it can make it harder for workers to complete their jobs. It may even damage their earning potential in the future, as well as their quality of life.

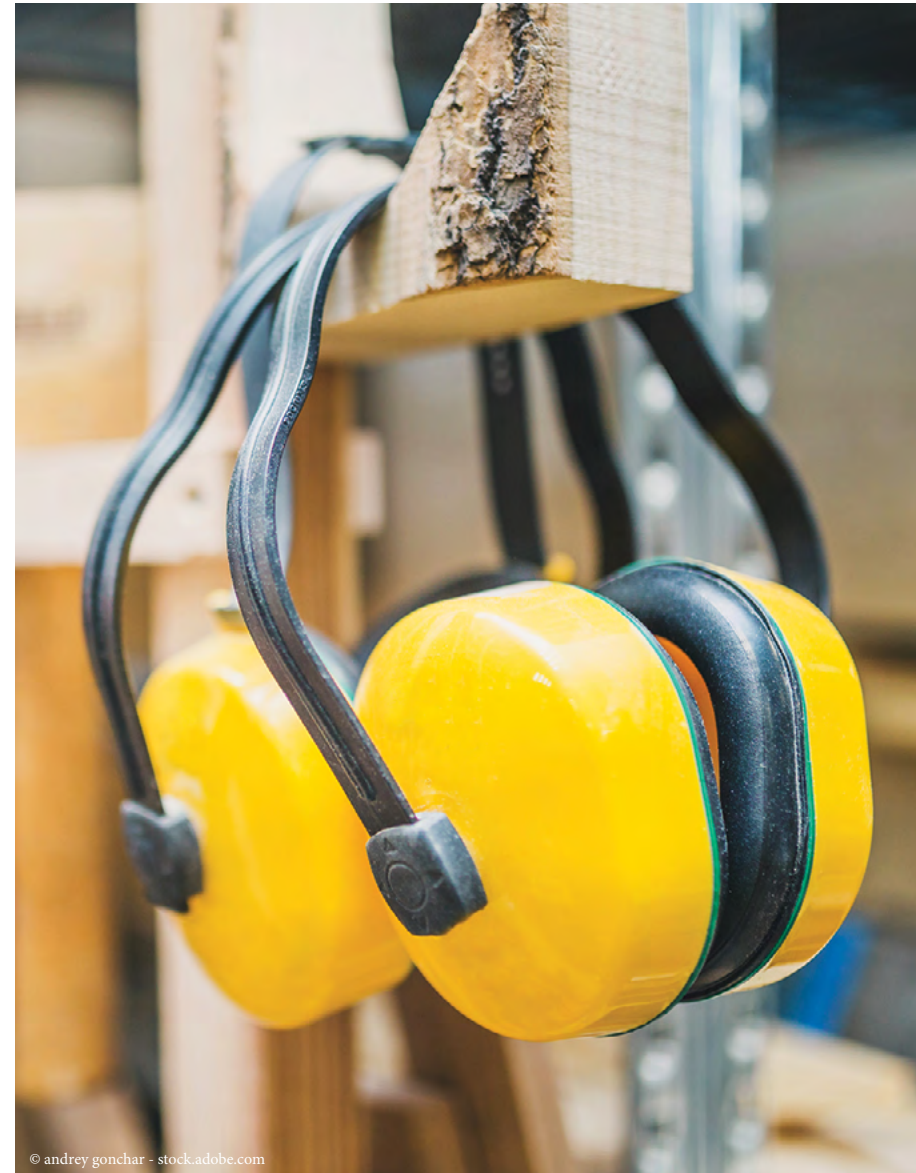
As noise damage can be cumulative, it isn't always immediately obvious that a worksite is dangerous. People might lose their hearing over years or even decades of being in high-volume environments. To that end, there have been some significant studies regarding the safe levels of noise, including safe sustained levels. Work sites need to follow these guidelines, if they want to protect their employees.

Personal protective equipment (PPE) is often used to protect employees from loud noises. However, it's usually better to reduce the exposure to loud noises in the first place. PPE can be cumbersome and introduce other types of danger, such as employees potentially not hearing warnings from each other in dangerous situations.

Reducing Noise at a Worksite

In industries such as construction, many types of machinery are naturally loud. It's not always possible to reduce noise at a worksite, but it is possible to make some changes to reduce the overall risk to employees. It's understood that employers may not be able to entirely secure a worksite, but an employer cannot be negligent about securing their work sites.

- Always have employees use hearing protection.** All workers need to use hearing protection whenever they're in a dangerously loud area. Employees need to be trained on the proper use of hearing protection, so they can use this protection safely—and they should understand that there are consequences to not following protocol.
- Look into low-noise machinery.** There are machinery options available that reduce the amount of noise at the site. Low-noise machinery may have dampeners designed to reduce the amount of noise produced or have additional insulation to limit the sound traveling.
- Audit the site for unnecessary noises.** A machine can be brought in to detect the current noise levels of the worksite and determine whether those levels could be potentially dangerous. At the same time, an auditor can walk through the site and determine whether there might be any unnecessary levels of noise, such as machines being run when they don't need to be run.



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- **Install barriers and screens.** Barriers, screens and enclosures can all be used to reduce the amount of sound throughout a worksite. These can be erected around louder areas.
- **Use a limited number of employees.** Only the employees who are necessary to operate machinery should be exposed to the noise of that machinery; otherwise, the work area should be cleared. Likewise, the machinery should be used

only during slow times at the worksite, and employees should be kept as far away from it as possible.

- **Limit the amount of time spent in loud areas.** In general, workers shouldn't be in loud areas for long periods of time. Even with sound protection, it's still not healthy. Extremely loud areas should be considered restricted, and employees should be in those areas for a limited amount of time.

- **Enact comprehensive employee training.** Employees need to be given thorough training regarding their hearing health, especially on work sites that are dangerous. Employees should completely understand the dangers, and they should be trained on the methods that they can use to conserve their hearing.

Regular audits should be conducted to make sure workers are taking the appropriate safety precautions. If there are any issues found, they should be assessed and addressed in a timely fashion.

The Legal Consequences of Noise Damage

When an employee suffers from noise-related damage, it will fall under workers' compensation. This is true even if the employee made a mistake, such as not wearing their PPE. Workers' compensation provides a certain amount of coverage but, like all types of coverage, there's a coverage cap.

If a worksite is found to have a negligent level of damage, the company may be found completely liable. Furthermore, a worksite could be found to have negligent business processes, such as allowing employees to spend irregular amounts of time in high noise environments. Ultimately, the legal consequences of noise damage could be significant, as it could include the earning potential of the employee for the rest of their life.

Many work sites produce excessive amounts of noise, which can become harmful to employee health. If it does, then employees may need to lodge workers' compensation claims or liability claims against the organization. It's in the organization's best interest to protect its employees, both for employee morale, as well as reduced financial risk. **IHW**

Heather Perl is a Content Writer with Improv Learning.



How to Manage an Effective Hearing Conservation Program

By: Timothy Hicks, Contributor

Noisy work environments can cause hearing loss in workers assigned to those areas. Equipment that generates unwanted sound, or noise at or above 85 decibels, A-weighted (dBA), is normally the cause. Understanding the amount of noise in the workplace is the first step in managing an occupational hearing conservation program.

It is in the best interests of the employer and the workers to reduce the impact of noise sources in the workplace using engineering controls. The duration of contact with those sources informs the risk for hearing loss among exposed workers.

Noise dosimetry data (i.e., exposure sampling) collected from workers assigned to areas where sources are present will indicate if a hearing conservation program is needed. An effective program, including annual audiometric surveillance of workers exposed to noise levels equal to or exceeding the OSHA Action Level of 85dBA, can assist an employer in detecting early signs of hearing loss. This also provides a measure for the effectiveness of selected noise controls.

Identify and Detect Sources

Mature hearing conservation programs have identified workplace noise sources of concern and have, hopefully, managed them to reduce the magnitude of exposure at the point of impact, the aural zone. In some fixed facilities with heavy, rotating industrial equipment, this may be next to impossible or at least “infeasible.”

For this situation, what do most employers do? Some rotate workers in and out of the noisy areas, so as not to exceed the eight-hour, time-weighted average Action Level (AL) of 85dBA. Care should be taken when choosing this administrative control, however, as it only takes

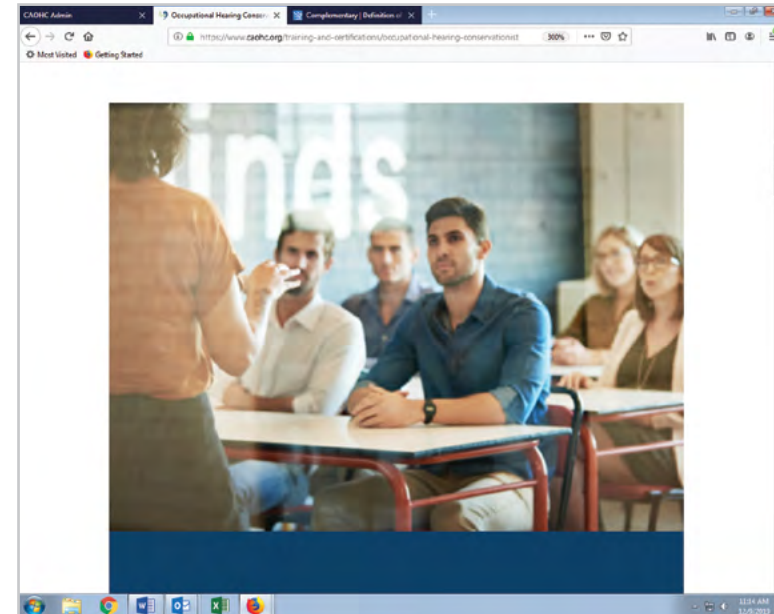
one exceedance per year to require medical (audiometric) surveillance (testing) of an exposed worker, according to a standard interpretation issued by OSHA in 2004.

If you are an employer that believes the effective use of personal protective equipment (PPE), such as plugs, muffs or noise-cancelling devices can be useful, I agree. They certainly can be effective when used properly by trained employees who do so each-and-every time one enters an area exceeding 85dBA.

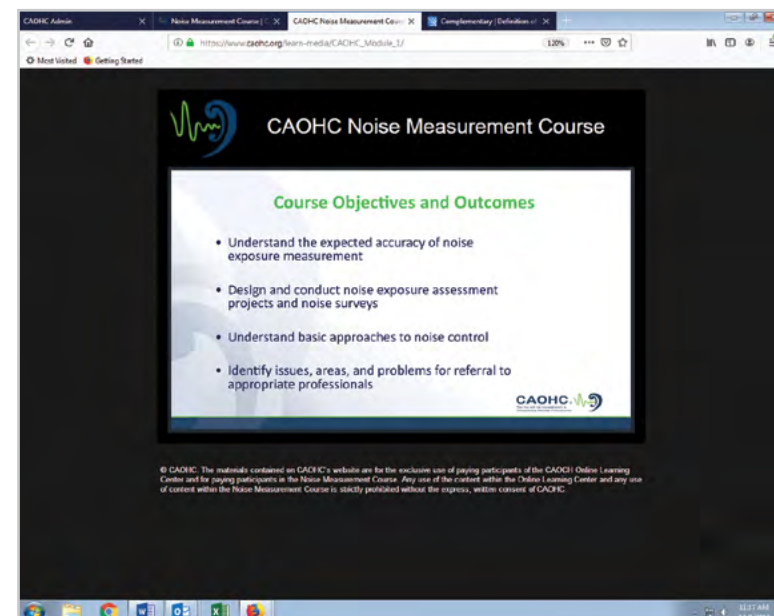
If you are an employer that believes exposure to noise disappears or is reduced to a manageable level using PPE, such that an audiometric testing program can be discontinued on the basis of PPE use, think again. While hearing protective devices can reduce noise levels inside the ear, the noise remains—as does the potential for exposure. Audiometric testing programs provide a useful means of identifying early signs of hearing loss among exposed workers and can provide insight into the effectiveness of your hearing conservation strategy.

Administering a hearing conservation program in a general industry environment is no easy task. Mobile workers, impact noise and occasional use of noisy mobile equipment can exacerbate this responsibility. Knowing what is making noise and how often workers are near the noise source(s) is the first step in identifying workers, or groups of workers (e.g., similar exposure groups) having the potential to exceed the AL and, therefore, are at risk for noise-induced hearing loss (NIHL). This is, of course, why OSHA requires audiometric testing of these individuals.

In a static work environment with a continuous process (and noise), the process of identifying noise-exposed workers may be fairly easily. If Worker A stands at



It is in the best interests of the employer and the workers to reduce the impact of noise sources in the workplace using engineering controls. (photo courtesy CAOHC)



The Council for Accreditation in Occupational Hearing Conservation (CAOHC) offers an online Noise Measurement Course that provides guidance for conducting noise exposure surveys and subsequent data evaluation and is a useful resource for industrial hygienists or hearing conservation program administrators. (photo courtesy CAOHC)

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Machine A operating station for four hours, his/her exposure can be estimated with a sound level meter and some math. In a dynamic work environment and/or batch process, noise levels are variable, and exposures may differ with a change in equipment or its placement in the work area.

Many other safety programs and processes, such as the concept of Management of Change, can identify impending changes in the workplace and assist an industrial hygienist in modifying worker noise exposure estimates.

When to Assess Workers

When exposure assessments change, particularly when workers are no longer exposed to the AL, removal of those workers from the testing program is necessary. In mature programs comprised of workers who have had hearing acuity tested annually as part of a surveillance program for years, this process may be perceived as a benefit. Removal of any worker benefit is generally unpopular. As such, this “benefit” may be continued unnecessarily. This phenomenon can lead to more workers enrolled in the program over time, some of whom are no longer exposed to enough noise to warrant enrollment.

While some disagreement exists among medical researchers, the consensus opinion remains that NIHL stops when workers are removed from the noise. An effective hearing conservation program requires ongoing management to determine who should be monitored and who should not.

Screening audiometric test results can provide a clue about the etiology of hearing impairment. There are many clinical characteristics associated with NIHL. For example, early NIHL is suspected when a reduction in hearing acuity occurs at the 2,000-4,000 Hertz frequencies. Threshold shifts identified from audiometric screenings should prompt the hearing conservation program

administrator to investigate attribution of the shift to the occupational environment.

If noise exposures at or above the time-weighted AL are not occurring in the workplace, audiometric screening is not required in accordance with the OSHA Standard. Yet, NIHL is only one of a few types of hearing loss a worker may suffer. Consideration should be given for keeping workers enrolled in a hearing conservation program, if they are exposed to occupational and/or environmental ototoxic chemicals, compounds or other agents.

A physician or a certified audiologist can advise an administrator as to whether a loss should be recorded as an occupational illness on the employer's OSHA 300 log. Work-relatedness determinations should be made in consultation with physicians and/or licensed health care professionals, such as a “Professional Supervisor” certified by the Council for Accreditation in Occupational Hearing Conservation (CAOHC), when necessary. Employers should find a difficult path arguing the work-relatedness of hearing loss found as a result of an audiometric testing program administered in accordance with the Occupational Noise Standard.

Control Noise Exposure

Hearing acuity may decline in workers from the beginning to the end of a shift, known as a temporary threshold shift. As hearing conservation professionals, we are tasked with preventing this by controlling the noise or worker exposure to it, as recurring temporary shifts will eventually result in a permanent one.

This phenomenon may occasionally result in mistakenly characterizing a temporary shift as permanent. Certainly, retesting individuals identified with a standard threshold shift within 30 days of the initial test may assist an administrator in determining the permanence or accuracy of the initial test. Given the fact these tests are subjective and

dependent on an individual's response to auditory stimuli, some year-to-year variation in individual test results should be expected. This phenomenon, coupled with changes in the quality of audiometric testing and/or equipment, often leads to difficulty determining whether a threshold shift is permanent or spurious.

NIHL is insidiously slow and nearly imperceptible among affected patients. Certainly, industrial noise is a major contributor to NIHL when noise exposures at or above the AL, time-weighted average occur in the workplace.

Significant noise exposures may exist outside the workplace, also. Measuring the relative contribution from the workplace or home is so difficult, that any contribution from the workplace is often viewed as the primary cause of loss. Unfortunately, no compensation or prosthetic equipment will mitigate permanent hearing loss, allowing a patient to recover the part of themselves that has been lost forever. Therefore, primary and secondary prevention remains the best strategy for protecting noise-exposed workers. **IHW**



About the Author:

Timothy Hicks, MSPH, CIH, CSP serves as a council member for The Council for Accreditation in Occupational Hearing Conservation (CAOHC) representing the American Society of Safety Professionals (ASSP). In his professional life, Hicks serves as a Health, Safety and Environment (HSE) Executive with broad-ranging technical experience in public health and industrial hygiene. He holds a Master of Science–Public Health from Tulane University. He has over 20 years' experience in occupational health and safety and is currently President of HHS Consulting, Inc. of Charleston, SC./Golden, Colo.

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