



NATIONAL SAFETY COUNCIL

Position/Policy Statement

Hearing Protection

POSITION / POLICY:

The National Safety Council (NSC) supports the adoption of more protective noise level regulations to prevent hearing loss, including updating the 35 year-old Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) to 85 dB (A) (Decibels on the A-weighted scale) and the exchange rate to 3 dBA consistent with NIOSH guidelines published in 1998.¹ These recommended exposure limits will provide better protection from hearing loss for workers.

Additionally, all industries and workplaces should emphasize the use of a well-known practice known as the hierarchy of controls.² This approach groups actions by their likely effectiveness in reducing or addressing the hazard. In most cases, the preferred approach is to eliminate the source of hazardous noise. When elimination is not possible, substituting quieter equipment may be the next best alternative to protect workers from hazardous noise.

If the hazardous noise cannot be controlled through elimination of the source or substitution of quieter equipment, engineering controls may be installed to reduce noise to safer levels or remove noise at the source. Engineering controls require physical changes to the workplace such as redesigning equipment to eliminate noise sources and constructing barriers that prevent noise from reaching a worker. If it is not possible to remove the hazard through elimination, substitution or engineering controls, the next step is to reduce noise exposure through the use of administrative controls. For example, an employer may change an employee's work schedule to avoid too much noise.

Personal protective equipment (PPE), such as ear plugs or other hearing protection devices, is the last option in the hierarchy of control. PPE is generally less effective than elimination, substitution, and engineering controls because the effectiveness of human actions is inconsistent. However, when used in combination with other levels of control, such as administrative controls, PPE may provide worker protection when engineering controls do not adequately remove the noise hazard.

¹ Relative loudness of sounds as perceived by the human ear.

² <https://www.cdc.gov/niosh/topics/noisecontrol/default.html>

Justification

Hearing loss can take many forms: It can be mild or severe, present at birth or begin later in life, occur gradually or suddenly. It is estimated that 30 million people in the United States have hearing loss, and hearing loss has been identified as the fifth leading cause, globally, of years lived with disability. Furthermore, as the U.S. population of older adults increases, hearing loss will become an area of greater concern.³

- Approximately 22 million workers are exposed to potentially damaging levels of noise every year.⁴
- Hearing loss affects 49 million Americans.⁵
- Hearing loss disabilities cost approximately \$242 million annually.⁶
- An estimated 15 percent of Americans between the ages of 20 and 69 have hearing loss, some of which may have come from noise at work.⁷
- Noise-induced hearing loss is 100 percent preventable, but it is permanent and irreversible once acquired.⁸

Background

The amplitude, or loudness, of a sound is measured in decibels (dB). Some regulations report the level of decibels in the dBA scale, which is a weighted measure that corrects for decibel levels at lower frequencies (most closely mirrors the human ear). As the amount of decibels increases, the likelihood of noise-induced hearing loss (NIHL) increases.⁹ It is important to note that decibels are measured on a logarithmic scale, so a small increase in decibel level can increase the danger of hearing loss greatly.¹⁰ Another important term is the decibel exchange rate, which records the reduction in the amount of time that one can safely be exposed to a noise as that noise's decibel level increases. For example, according to The National Institute for Occupational Safety and Health (NIOSH), every 3-dB increase in noise level reduces the allowable exposure time by half.¹¹ Both of these measurements are key for creating a safe work environment. To understand the scale of decibel levels in the real world, some common noises and their associated decibel level are listed below:

- Normal conversation - 60 dB
- Operating of powered industrial trucks (forklifts) – 84 dB
- Lawn mower - 90 dB
- Operating a hand held power tool - 94 dB
- Operating a grinder - 97 dB
- Operating a crane - 102 dB
- Operating a jackhammer - 105 dB
- Using a nail gun - 120 dB
- Concerts - 120 dB

³ <http://nationalacademies.org/hmd/reports/2016/Hearing-Health-Care-for-Adults.aspx>

⁴ <https://www.osha.gov/SLTC/noisehearingconservation/>

⁵ <https://www.webmd.com/a-to-z-guides/hearing-loss-causes-symptoms-treatment#1>

⁶ Ibid.

⁷ <https://www.healthyhearing.com/report/52514-What-is-a-decibel>

⁸ <https://blogs.cdc.gov/niosh-science-blog/2016/02/08/noise/>

⁹ <https://whatis.techtarget.com/definition/A-weighted-decibels-dBA-or-dBa-or-dBa>

¹⁰ <https://www.osha.gov/SLTC/noisehearingconservation/>

¹¹ <https://blogs.cdc.gov/niosh-science-blog/2016/02/08/noise/>

- Firearms - 150 dB

Harmful hearing levels can affect anyone regardless of where they live or what profession they have. Individuals in noisy workplaces, however, are particularly at risk due to the amount of time that they spend in their environment. To combat this, there are federal guidelines controlling noise levels in the workplace. Currently, NIOSH has established a recommended exposure limit (REL) of 85 dBA and an exchange rate of 3 dB. These limits are lower than the existing PEL that was established by the Occupational Safety and Health Administration (OSHA), last revised in 1983. (The existing PEL is an exposure limit of 90 dBA and an exchange rate of 5 dB. However, OSHA does have a noise Action Level of 85 dBA.¹²) There are companies that are already using the NIOSH guidelines to help prevent hearing loss.

From NIOSH:¹³

NIOSH establishes RELs to protect workers against the health effects of exposure to hazardous substances and agents encountered in the workplace. These NIOSH limits are based on the best available science and practices. In 1998, NIOSH established the REL for occupational noise exposures to be 85 decibels, A-weighted (dB[A]) as an 8-hour time-weighted average. Exposures at or above this level are considered hazardous. The REL is based on exposures at work 5 days per week and assumes that the individual spends the other 16 hours in the day, as well as weekends, in quieter conditions. Importantly, the NIOSH REL is not a recommendation for noise exposures outside of the workplace in the general environment.

NIOSH also specifies a maximum allowable daily noise dose, expressed in percentages. For example, a person continuously exposed to 85 dB(A) over an 8-hour work shift will reach 100% of their daily noise dose. This dose limit uses a 3-dB time-intensity tradeoff commonly referred to as the exchange rate or equal-energy rule: for every 3-dB increase in noise level, the allowable exposure time is reduced by half. For example, if the exposure level increases to 88 dB(A), workers should only be exposed for four hours. Alternatively, for every 3-dB decrease in noise level, the allowable exposure time is doubled, as shown in the table below.

**Average Sound Exposure Levels Needed to Reach the
Maximum Allowable Daily Dose of 100%**

Time to reach 100% noise dose	Exposure level per NIOSH REL
8 hours	85 dB(A)
4 hours	88 dB(A)
2 hours	91 dB(A)
60 minutes	94 dB(A)
30 minutes	97 dB(A)
15 minutes	100 dB(A)

Additionally, hearing loss has numerous negative effects on society. Perhaps most importantly, those who suffer from hearing loss are much more prone to stress, lower productivity, difficulty

¹² Action level is the level at which hearing protection is required.

¹³ Ibid.

with communication and greater likelihood of causing workplace accidents.¹⁴ Left untreated, hearing loss is also associated with lower quality of life, depression, higher blood pressure and social isolation.¹⁵ There is also an economic component of hearing loss. The societal cost of someone with severe hearing loss is approximately \$300,000 per person over their lifetime.¹⁶

Safe Standards

To protect workers, NSC supports a standard of lowering the PEL to at least 85 dBA and the exchange rate to 3 dBA. Additionally, NIOSH has outlined a few potential ways to reduce the likelihood of hearing loss in the workplace, including buying quiet equipment, moving workers away from the loudest machines, changing exposure times to loud noise, and protecting the worker with personal protective equipment.¹⁷ The most effective step is to remove the source of the noise, but that is not always possible. Regardless of how it is done, lowering the noise level to a level underneath these new limits would be greatly beneficial to worker safety and health.

Conclusion

Lowering the OSHA PEL to at least 85 dBA and the exchange rate to 3 dBA will improve worker safety and wellbeing while lowering costs for both workers and employers. NSC also urges awareness of decibel levels outside of the workplace. While the 85 decibel limit may not apply in every situation, the public must still be aware of the everyday dangers of loud noises, from construction jobs to concerts. Increased awareness of these dangers will help prevent hearing loss for everyone.

This position statement reflects the opinions of the National Safety Council but not necessarily those of each member organization.

Adopted by the National Safety Council, 2018

¹⁴ <https://www.osha.gov/SLTC/noisehearingconservation/healtheffects.html>

¹⁵ <https://www.healthyhearing.com/help/hearing-loss>

¹⁶ <https://www.hear-it.org/the-economic-burden-of-hearing-loss>

¹⁷ <https://www.cdc.gov/niosh/topics/noise/reducenoiseexposure/noisecontrols.html>