Hearing Protectors Fact Sheets



HOW CAN I PROTECT MY HEARING AT WORK?

The surest methods of preventing noise-induce hearing loss (NIHL) is to eliminate the source, or to reduce noise at the source by engineering methods. However, in certain situations, these measures are not possible. In such workplaces, workers may need to wear hearing protectors to reduce the amount of noise reaching the ears.

What are some things I should know about selecting hearing protection devices?

People should wear a hearing protector if the noise or sound level they are exposed to is close to or greater than the occupational exposure limits (OEL) for noise. For most jurisdictions, this occupational exposure limit is 85 decibels (A-weighted) or dBA. Hearing protectors reduce the noise exposure level and the risk of hearing loss when worn correctly.

If hearing protection is required, then a complete hearing conservation program should be implemented. A hearing conservation program includes noise assessment, methods for controlling noise, hearing protector selection, employee training and education, audiometric testing, maintenance, inspection, record keeping, and program evaluation.

The effectiveness of hearing protection is reduced greatly if the hearing protectors do not fit properly, are not inserted or worn correctly, if they are worn only periodically, or if they are removed even for a short period of time. To maintain their effectiveness, the hearing protection should not be modified. Radio/music earphones or headsets are not substitutes for hearing protectors and should not be worn where hearing protectors are required to protect against exposure to noise.

Select hearing protection that is:

- Correct for the job.
- Provides adequate protection or noise attenuation. Check the manufacturer’s literature.
- Compatible with other required personal protective equipment, or communication devices.
- Comfortable enough to be worn.
- Appropriate for the temperature and humidity in the workplace.
- Able to provide adequate communication and audibility needs (e.g., the ability to hear alarms or warning sounds).

What types of hearing protectors are available?

Earplugs are inserted in the ear canal. They may be premolded (preformed), moldable, rolldown foam, push-to-fit, or custom molded. Disposable, reusable and custom earplugs are available.

Semi-insert earplugs which consist of two earplugs held over the ends of the ear canal by a rigid headband.

Earmuffs consist of sound-attenuating material and soft ear cushions that fit around the ear and hard outer cups. They are held together by a head band.

How do I pick my hearing protectors?

The choice of hearing protectors is a very personal one and depends on a number of factors including level of noise, comfort, and the suitability of the hearing protector for both the worker and the environment. Most importantly, the hearing protector should provide the desired noise reduction. It is best, where hearing protectors must be used, to provide a choice of a number of different types to choose from.

If the noise exposure is intermittent, earmuffs are more desirable, since it may be inconvenient to remove and reinsert earplugs.

How can I find out how much a hearing protector can reduce a worker's exposure to noise?

Manufacturers provide information about the noise reducing capability of a hearing protector referred to as an NRR (noise reduction rating) value. The NRR ratings are based on laboratory conditions, therefore calculations to de-rate the noise reduction rating should be done to reflect workplace conditions (see further below).

CSA Standard Z94.2-14 (R2019) Hearing protection devices – Performance, selection, care, and use defines noise reduction rating as "a single number rating that indicated the overall hearing protector attenuation, computed as the difference between the overall C-weighted level of a noise spectrum having equal energy per octave and the A-weighted noise levels under a hearing protector, using mean attenuation data less two standard deviations, derived from the experimenter-fit-procedure of the 1974 edition of ANSI Z3.19 (withdrawn) as defined in EPA (1979)".

How do I use Noise Reduction Rating (NRR)values to determine the protection provided by a hearing protector?

The NRR, or other similar systems such as the single number rating (SNR), is a method to more accurately determine the effective exposure of a person when wearing a hearing protector. These rating systems attempt to estimate the actual sound protection provided by hearing protectors when worn in actual working environments (vs. laboratory testing situations). The "real world" results are often different than laboratory tests with the main reasons for this difference being poor fit, and lack of proper training, supervision and enforcement. For these reasons, training on the correct fit, and making sure users have a thorough understanding of hearing loss are important elements of the hearing conservation program.

Detailed calculations of the protection provided by a hearing protector involves using octave band analysis of the workplace noise and the noise attenuation provided by the hearing protector for noise in each octave band. Attenuation is defined by Regulators Hearing protection devices – Performance, selection, care, and use as "the reduction in sound pressure level incident upon the ear due to the application of a hearing protector or, specifically, the change in hearing threshold level that results when a hearing protector is worn."

Calculating noise attenuation of hearing protection and de-rating noise reduction values (NRR)

Earplugs

Percent of NRR achieved: 50%

For use with dBA: Leq – [NRR (0.50 – 3] = XX dBA

For use with dBC: Lceq – NRR (0.5) = XX dBA

Earmuffs

Percent of NRR achieved: 70%

For use with dBA: Leq – [NRR (0.7 – 3] = XX dBA

For use with dBC: Lceq – NRR (0.7) = XX dBA

Dual Protection (use of earplugs and earmuffs)

Percent of NRR achieved: 65%

For use with dBA: Leq– [(NRR + 5) (0.65) – 3] = XX dBA

For use with dBC: Lceq – (NRR + 5) (0.65) = XX dBA

What is a Single Number Rating (SNR)?

An SNR is a single number rating system determined according to International Standard ISO 4869 – Acoustics – Hearing Protectors. These tests are carried out by commercial laboratories that are independent of the manufacturers. Like NRRs, SNRs are expressed in decibels and are used as a guide for comparing the potential noise reduction capability of different hearing protection devices. Since the procedures for measuring NRRs and SNRs are different, the NRR and SNR values for an individual hearing protector are different.

What are the advantages and limitations of earplugs and earmuffs?

Both types of hearing protection offer advantages and disadvantages.

Earplugs can be mass-produced or individually molded to fit the ear. They can be reusable or disposable. On the positive side, they are simple to use, less expensive than muffs, and often more comfortable to wear when in hot or damp work areas. Some disadvantages are they provide less noise protection than some muffs, and should not be used in areas exceeding 105 dBA. They are not as visible as muffs, making it more difficult for supervisor to check to see if workers are wearing them. They must be properly inserted and inserted hygienically to provide adequate protection.

Earmuffs can vary with respect to the material and depth of the dome, and the force of the headband. The deeper and heavier the dome, the greater the low-frequency attenuation provided by the protector. The headband must fit tightly enough to maintain a proper seal, yet not be too tight for comfort. Some advantages are that earmuffs usually provide greater protection than plugs, although this is not always true. They are easier to fit, generally more durable than plugs, and they have replaceable parts. On the negative side, they are more expensive, and often less comfortable than plugs, especially in hot work areas. In areas where noise levels are very high, muffs and plugs can be worn together to give better protection.

The following table summarizes the differences between earplugs and earmuffs.

Comparison of Hearing Protection	
EarPlugs	**EarMuffs**
Advantages: **• small and easily carried** **• convenient to use with other personal protection equipment (can be worn with earmuffs)** **• more comfortable for long-term wear in hot, humid work areas** **• convenient for use in confined work areas**	**Advantages:** **• less attenuation variability among users** **• designed so that one size fits most head sizes** **• easily seen at a distance to assist in the monitoring of their use** **• not easily misplaced or lost** **• may be worn with minor ear infections**
Disadvantages: **• requires more time to fit** **• more difficult to insert and remove** **• require good hygiene practices** **• may irritate the ear canal** **• easily misplaced** **• more difficult to see and monitor usage**	**Disadvantages:** **• less portable and heavier** **• more inconvenient for use with other personal protective equipment.** **• more uncomfortable in hot, humid work area** **• more inconvenient for use in confined work areas** **• may interfere with the wearing of safety or prescription glasses: wearing glasses results in breaking the seal between the earmuff and the skin and results in decreased hearing protection.**

Why is user preference so important?

The human aspects of hearing protection are particularly important since the only useful kind of protection is the protection that is actually worn. Some people do not accept particular kinds of protectors; every human being is different, and the anatomy of the ear and ear canal can vary significantly from person to person.

It is a good idea for the employer to provide a number of different types of hearing protection from which workers can choose, keeping in mind any safety or hygienic reasons for not providing a particular kind of protector. That is, a particular type of protector should not be used if noise levels are too high or if it proves to be inadequate from a hygienic point of view. For example, earplugs which are used in a plant setting where people reuse them throughout the day, often reinserting them with dirty fingers, can introduce dirt and bacteria into the ears, causing ear infections.

The bottom line on hearing protection is worker preference. If the workers do not like the type of protection (for example, if it is uncomfortable, does not fit well, or is impractical), they will not wear it.

What should I know about the fit of my hearing protectors?

Follow manufacturer’s instructions. With earplugs, for example, the ear should be

pulled outward and upward with the opposite hand to enlarge and straighten the ear canal, and insert the plug with clean hands.

- Ensure the hearing protector tightly seals within the ear canal or against the side of the head. Hair and clothing should not be in the way.

What happens to the protection level when hearing protectors are removed for short periods of time?

In order to get full benefit, hearing protectors must be worn all the time during noisy work. If hearing protectors are removed only for a short duration, the protection is substantially reduced. The following table gives a maximum protection provided for non-continuous use of an ideally fitted 100% efficient hearing protector. For example, when hearing protection is rated with an attenuation of 25dB, if one takes off his/her hearing protector for 5 minutes in an hour the maximum protection will be reduced to no more than 11dB.

Impact of removing hearing protection	
Time removed (in 1 hr)	**Maximum 25 dB Protection is reduced to (dB)**
0 min	**no reduction**
1 min	**17**
5 min	**11**
10 min	**8**
30 min	**3**
60 min	**0**

Source: Removal of hearing protectors severely reduces protection.

Hearing protectors must be used **ALL THE TIME** to get full benefit.

How should I care for my hearing protection device?

- Follow the manufacturer’s instructions.
- Check hearing protection regularly for wear and tear.
- Replace ear cushions or plugs that are no longer pliable.
- Replace a unit when head bands are so stretched that they do not keep ear cushions snugly against the head.
- Disassemble earmuffs to clean.

- Wash earmuffs with a mild liquid detergent in warm water, and then rinse in clear warm water. Ensure that the sound-attenuating material inside the ear cushions does not get wet.
- Use a soft brush to remove skin oil and dirt that can harden ear cushions.
- Squeeze excess moisture from the plugs or cushions and then place them on a clean surface to air dry. (Check the manufacturer’s recommendations first to find out if the earplugs are washable.)

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