RADIANS®

HEARING PROTECTION FAST FACTS

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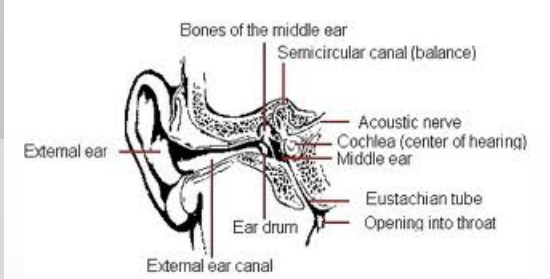
Workers have been using hearing protection devices (HPD) since the 1960's to protect themselves from high levels of noise. Approximately 30 million workers in the United States are occupationally exposed to hazardous noises each year. 10 million of those workers suffer from noise induced hearing loss (NIHL) according to NIOSH. For more than 25 years hearing loss has been listed as one of the most prevalent occupational health concerns. Permanent hearing loss can occur when exposed to high levels of noise. Repeated exposure to high levels of noise can cause tinnitus (ringing in the ears). Other issues related to loud noise at work are physical and psychological stress, reduction in concentration and communication, loss of productivity, and increased probability of work related accidents.

With radically smart products, the right education, and a structured hearing conservation program noise-induced hearing loss is 100% preventable.

100% Preventable.



Hearing and Noise Reduction Overview

According to the World Health Organization noise-induced hearing loss (NIHL) is the most common, permanent, and preventable occupational injury in the world.

Noise damage is different from most other occupational injuries. It causes no pain or visible trauma, the ears do not bleed when hearing is being damaged, it leaves no visible scars, it is unnoticeable in its earliest stages, it accumulates with each over-exposure, and it generally takes years to diagnose.

Damage occurs as sound waves from high noise levels enter your ear canal and cause the eardrum to vibrate. Small bones behind your eardrum transmit these vibrations to the cochlea. Receptor cells in the cochlea convert these vibrations into electrical impulses and send them to your brain. These vibrations are then interpreted as sound. When high noise levels damage your hearing it does not damage the eardrum or bones. Loud noise damages the receptor cells in the cochlea overtime. Unlike other cells in your body that can regenerate, nerve cells in the cochlea, once damaged, are gone forever.

So if somebody has hearing loss, how can we tell whether it is caused by noise? Here are the five common indicators of noise-induced hearing loss:

1. The amount of time exposed to loud noise. There is no delayed effect in regards to noise damage.
2. It is almost always a high-frequency hearing loss.
3. It is usually bilateral (affects both ears equally). There are some exceptions to this but for employees who are on their feet during the workday; the hearing loss is usually in both ears equally.
4. Gradual progression. We don't measure hearing loss due to noise in terms of days or weeks. It usually takes us years to notice the permanent change in hearing.
5. Appropriate symptoms. If a worker says he has pain in his ears or drainage this is probably not due to high noise levels. Ringing in the ears, tinnitus is a common symptom that is linked to noise-induced hearing loss.

Basically If you experience a ringing or humming in the ears after work, inability to communicate with a co-worker when only an arm's length away, and/or temporary hearing loss at any time the background noise is most likely hazardous.

The American National Standard Institute (ANSI S12.6) entitled, Methods for Measuring the Real-Ear Attenuation of Hearing Protection, specifies laboratory-based procedures for measuring, analyzing and reporting the passive noise-reducing capabilities of hearing protection devices (HPD). The actual effectiveness of any individual protector cannot be determined under workplace conditions. OSHA's noise standards requires that personal hearing protection be worn to attenuate the occupational high noise exposure of employees and the National Institute for Occupational Safety and Health(NIOSH) recommends that all workers exposures to noise should be controlled below a level equivalent to 85dBA for eight hours to minimize occupational noise induced hearing loss.

A dB (Decibel) is the unit used to express the intensity of sound. The decibel scale is a logarithmic scale in which 0 dB approximates the threshold of hearing in the mid frequencies for young adults and in which the threshold of discomfort is between 85 and 95 dB. The threshold for pain is between 120 and 140 dB. Again the decibel scale is a logarithmic scale, not a linear scale. Similar to the Richter earthquake rating scale, small numbers represent enormous changes. Sound energy that is twice the level of 83 dB is not 166 dB, but rather 86 dB.

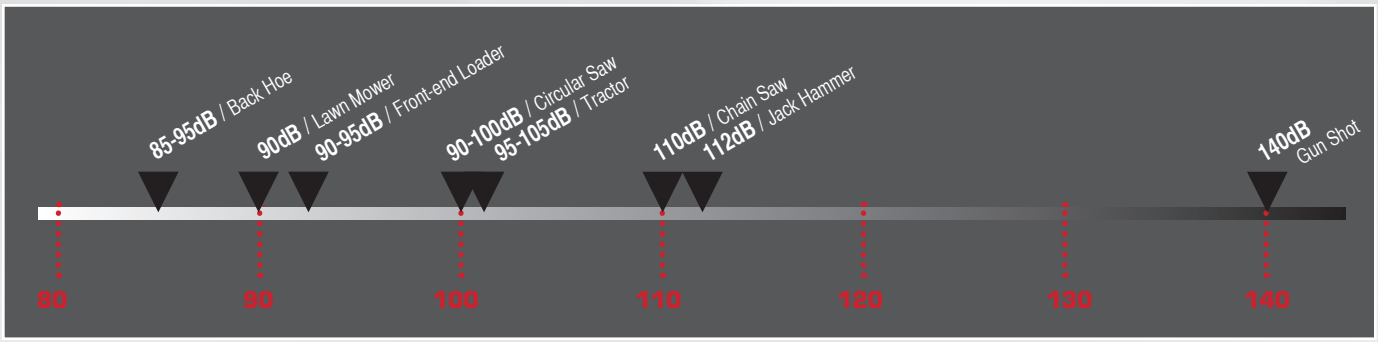
Damage from noise exposure depends on the loudness and length of exposure. Habitual exposure to noise above 85 dB will cause gradual hearing loss. HPD's are required when noise averages more than 90 dB during an 8-hour workday. For unprotected ears, the allowed exposure time decreases by one-half for each 5 dB increase in the average noise level. The table below shows noise levels and how long a person can be exposed without hearing protection before there is damage to the ear.

Noise Level Allowable Exposure Time:

Continuous dB	Permissible Exposure Time
85 dB	8 Hours
90 dB	4 Hours
100 dB	1 Hour
105 dB	30 Minutes
110 dB	15 Minutes
115 dB	0 Minutes

The two most common methods for monitoring noise levels are area sampling with a sound level meter or personal sampling with a noise dosimeter. The sound level meter reads the instantaneous noise level in a specific working environment and is accurate only when noise levels are constant in the area. For non-static workers with fluctuating noise exposures the noise dosimeter gives a more accurate measure of the exposure to noise. Both of these methods measure the unprotected exposure and then an estimate must be made for the protected exposure.

Some Common Equipment Noises (dB)

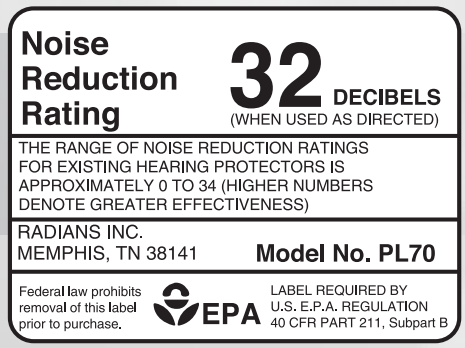


All Radians Hearing Protection compliant with ANSI S3.1974 standards.

NRR (Noise Reduction Raiting)

NRR (noise reduction rating) is a single number rating method which describes a hearing protection device (HPD) based on how much the overall noise level is reduced by the HPD. Most noise measurements in the industry are derived from the A-weighting scale. The A-scale is simply a filter applied to microphones on noise measurement devices that replicates the response of the human ear to sound. Hearing sensitivity in both low and high frequencies falls off in the human ear as it is not the perfect microphone. To account for this reduction in the low and high frequencies manufacturers of noise measurement devices include an A-weighting filter so that measurements are similar to what the human ear actually hears. The NRR theoretically provides an estimate of the protection that should be met or exceeded by 98% of the wearers of a given HPD.

The EPA has created a label and requires that all HPD's have this label on its packaging. The number in the top right of the label is the NRR. Today NRR values range from 1-34. Although a 34 NRR is the highest ever recorded no manufacture offers a HPD with a NRR over 33.



Wearing time is often overlooked by HPD buyers who select devices based on maximum ratings (highest NRR) without enough attention given to comfort or the potential noise in a given environment. NRR is also affected by employees who remove HPD's to communicate. This obviously reduces the effectiveness of the hearing protection device. When hearing protectors are not worn 100% of the time protection drops to less than half the stated protection level after only 30 minutes during eight hours of noise exposure.

Hearing Protection Types Overview

There are three primary types of noise related to HPD use: constant, intermittent, and impact/impulse. Constant noise requires single-use hearing protection, multi-use, banded hearing protection, or earmuffs. Intermittent noise will require banded hearing protection or earmuffs. Impact or impulse noises are the most severe and require the highest passive noise reducers, double plugging, or electronic/active HPD's.

Disposable Foam Earplugs

In the 1970s NASA developed memory foam to assist astronauts with overwhelming G forces. This material was later adapted to make earplugs because of its slow recovery capabilities and softness. The material of choice today is polyurethane (PU) which is open cell foam that is responsive to body heat and will in time contour to your ear canal when inserted properly. Our hands free manufacturing process is a complex system that carefully meters product into molds. The material is then cured and heated to produce the final product. Radians ear plugs are made of billions of open cells that allow noise to enter the plug. The sound waves then begin to fracture throughout the plug so that when it finally reaches your ear drum it is reduced to a safe level.

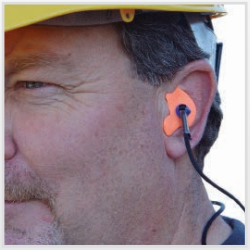
Foam earplugs can be made of polyurethane, polyvinyl, or PVC foam. They are self-adjustable and non-irritating, comfortable, and offer the most protection with NRRs of up to 33dB. Radians offers a full line of PU foam earplugs in barrel, bullet, bell, and winged shapes.

Foam earplugs are most notably characterized by their overall softness. They should feel soft to the touch, have a smooth skin, and a slow recovery when depressed or rolled. They are often available in fluorescent safety focused colors to aid in compliance verification. Foam earplugs are able to fit a large variety of ear canal shapes and sizes. Although they can technically be cleaned for reuse foam earplugs are considered disposable single-use earplugs. What makes foam earplugs attractive is that they are relatively inexpensive, are available in a wide variety of colors and styles, are lightweight, and most importantly they have a high user acceptance. All Radians foam earplugs are proudly made in the USA.

Reusable Earplugs

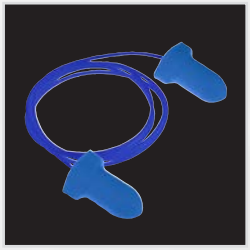
Reusable earplugs are made of silicone, polyvinyl, and other types of plastics/rubber. They can offer NRR's of up to 28. Because the materials that make-up reusable earplugs are non-porous they can be cleaned with warm water and soap. They are generally easy to insert and require no rolling. Reusable earplugs can be reused if kept clean and offer a lighter less cumbersome alternative to earmuffs.

Custom Molded Earplugs



Radians custom molded earplugs offer soft permanent earplugs with a personalized fit. They are made of a safe, non-toxic, hypoallergenic material that is long-lasting and washable. Easy to follow instructions create custom earplugs in only 10 minutes and deliver a NRR of 26. Custom molded earplugs eliminate compliance issues as the earplugs are custom fitted to each individual's ear canal. They will only go in the ear canal one way so there is no worry in regards to proper fitment. Radians custom molded earplugs are proudly made in the USA.

Metal Detectable



Designed primarily for the food processing industry, metal detectable plugs are embedded with a metal ball in the earplug for easy metallic detection. If the plugs drop into a line of food, the metal will be detected allowing for safe removal. Available in reusable and disposable plugs.

Banded Hearing Protection

Used in work environments where hearing protection in needed intermittently banded hearing protection can be a good light weight alternative to earmuffs. Although they tend to have a lower NRR than earplugs (NRR 23) they are easier to take in and out. Hearing bands traditionally consist of a plastic band with foam or silicon rubber earplug pods. The earplug pods can traditionally be reused if cleaned and taken care of properly. Radians Rad Band is made In the USA.

Earmuffs (Passive)

Earmuffs are easy to fit properly and are great for intermittent use. They come in a variety of shapes, sizes, and styles. NRRs also vary greatly and can be as low as 17dB or as high as 30dB. Depending on the model and/or style earmuffs can be a bit heavy and hot with extended wear. However they tend to be comfortable and easy to use while fitting a wide range of users. Earmuffs can be worn over the head, behind the ear, under the chin, and as a hard attachment. They are also available with lots of value added features like gel-pad cushions on the cups, padded headbands, compact folding headbands, and multi-position headbands. Because earmuffs are very visible they make it easy for safety officers to check for compliance. Worker acceptance tends to be lower than earplugs and they have a higher initial cost.

Earmuffs (Active)

Active earmuffs use electronic circuitry to cut or compress harmful impulse noises above 85 dB down to a safe level. Earmuffs that feature compression technology will reduce impulse noise to a safe level of 82db while still allowing you to communicate. Earmuffs that use cutting technology will cut out all impulse noise completely. Radians electronic earmuffs also feature microphones that enhance/amplify hearing. Although the recommended use for active earmuffs is with the electronics on they can also be switched off. When the electronics on an active earmuff are off the HPD functions as a passive earmuff and can be used in any environment. When the electronics are on they should only be used to protect against impulse noise.

Training (How to identify a need for HPD's)

For hazardous noise exposures, the hierarchy of controls should be:

1. Engineering Controls
2. Administrative Controls
3. Hearing Protection

Radians HPD's should be used in conjunction with engineering and administrative controls and not instead of these measures at the end-user level. Industries with high numbers of workers exposed to dangerous noise levels include: agriculture, mining, construction, manufacturing and utilities, transportation, and military facilities. (Source CDC)

How do you make a hearing protection device selection? Here are the three primary factors to consider: the type of noise; continuous vs. intermittent, cost, and worker preference. Keep in mind that worker compliance is one of the most important factors when considering the effectiveness of any HPD. If employees refuse to wear a given HPD because it is uncomfortable, cumbersome, or ineffective they are at risk for noise induced hearing loss.

Make sure you choose a HPD that is appropriate for the working environment. Over protection is just as potentially harmful as under protection. Simply choosing the highest NRR regardless of the decibel level of the environment can have hazardous consequences. If noise levels while using a HPD are brought below 70 dB then some workers may be unable to hear verbal communication or warning alarms.

Ask the end-user if they have on-site conservation program or if they have had a recent noise survey. Are their employees complaining about noise? Their answers will allow you to help them choose the right hearing protection device for their working environment. Radians has the hearing protection products that will give your customers the right tools to reduce and/or eliminate noise induced hearing loss in the workplace.

Notes:

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