



SAFETY BRIEF 2010-1

NOISE INDUCED HEARING LOSS

Protecting your ears from excessive noise is important because hearing loss is the most common irreversible occupational hazard in the world according to the World Health Organization.¹

How is Sound Measured?

Sound is measured in units called decibels. On the decibel scale, an increase of 10 means that a sound is 10 times more intense or powerful. To your ears, it sounds twice as loud. The humming of a refrigerator is 45 decibels, normal conversation is approximately 60 decibels, and the noise from heavy city traffic can reach 85 decibels. Sources of noise that can cause Noise Induced Hearing Loss (NIHL) include motorcycles, firecrackers, and small firearms; all emitting sounds from 120 to 150 decibels. Long or repeated exposure to sounds at or above 85 decibels can cause hearing loss. The louder the sound, the shorter the time period before NIHL can occur. Sounds of less than 75 decibels, even after long exposure, are unlikely to cause hearing loss.

Although being aware of decibel levels is an important factor in protecting one's hearing, distance from the source of the sound and duration of exposure to the sound are equally important.

(OSHA Table G-16) Permissible Noise Exposures	
Duration per day	Sound Level dBA
8 hours	90
6 hours	92
4 hours	95
3 hours	97
2 hours	100
1.5 hours	102
1 hours	105
.5 hours	110
.25 hours or less	115

When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each.

Standards

OSHA 1910.95 outlines the standards for hearing protection requirements.

An OSHA interpretation of the standard states "The Occupational Noise Exposure Standard requires the employer to provide hearing protectors to all general industry employees exposed to an 8-hour Time Weighted Average (TWA) of 85 decibels at no cost to the employees. This requirement is explicit in the noise standard.

Not only must employers provide hearing protection to their employees, they must

¹ <http://www.who.int/mediacentre/factsheets/fs258/en/>

provide employees with the opportunity to select their hearing protectors from a variety of suitable devices. At the very minimum, a choice of at least one type of ear plug and one type of earmuff must be provided, since individuals may be more comfortable in one type than another. The employer must ensure proper initial fitting and supervise the correct use of all hearing protectors.

Hearing protectors must be replaced as necessary, and their replacement must also be paid by the employer. All types of personal protective equipment have a limited life span. The foam seal that surrounds the ear on earmuffs, the flanges on rubber earplugs, and body of foam earplugs, all lose their elasticity. As hearing protectors wear out, their attenuation properties are diminished; the head band on earmuffs also can relax so that the muff no longer provides a snug fit.

Although some foam plugs can be washed several times in mild soap and water, they should usually be changed every day or two, especially in dusty or oily environments. Reinsertion of dirty plugs can cause ear infections.”²

Wearing the Proper Hearing Protection

Noise Reduction Rating (NRR) is the measure, in decibels, of how well a hearing protector reduces noise, as specified by the Environmental Protection Agency. The higher the NRR number, the greater the noise reduction. When dual protectors are used, the combined NRR provides approximately 5 decibels more than the higher rated of the two products. For example, using ear plugs (NRR of 29 decibels) with ear muffs (NRR 27) would provide a Noise Reduction Rating of 34 decibels.

Noise Reduction Ratings are listed within the product description for each hearing protector.³

Be sure that the Hearing Protection Device’s (HPD) NRR counteracts the sound level. There are different de-rating formulas to figure out what NRR is most appropriate for the sound

² www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=25014

³ <https://www.snipercentral.com/forums/viewtopic.php?p=18273&sid=6362c644983e6661aa4b47cdd57abad6>

level (see table Application of NRR for A weighted measurements). The EPA uses a straight forward approach using the unprotected sound level minus the NRR to yield the protected sound level. If the sound measurements were made with the dB(A) scale OSHA recommended de-rating factor is the sound level minus the ((HPD NRR less 7 dB) and then divided by two). National Institute for Occupational Safety and Health (NIOSH) recommends the following: 1) for earmuffs deduct 25% from the manufacturer’s NRR; 2) for formable earplugs deduct 50% from the NRR; 3) for all other earplugs deduct 70%.

Application of NRR for A weighted measurements		
(Assume a measured sound level exposure of 95 dBA in all examples. Assume an HPD that has NRR of 25 dBA.)		
Method	Formula	Example
EPA	Level – NRR	95–25= 70
OSHA	Level – (NRR – 7 dBA)/2	95–((25–7)/2) = 86
NIOSH	Level – (NRR – 7 dBA)	95 – (25 – 7) = 77

Note: No two ears are alike. So the same hearing protectors might work better on some people more than others. The above table is trying to compensate for this by making a formula of NRR that might be lost with the improper fitting of ear muffs and ear plugs.

Symptoms of Hearing Loss

Hearing loss may or may not be accompanied by tinnitus – a ringing, buzzing or fluttering in one or both ears. Sometimes short duration exposure to sound may only cause temporary hearing loss. Temporary hearing loss is called a *temporary threshold shift*. This means that if a sound was first heard at some level of intensity, after over- exposure to loud sounds that same sound would need to be louder in order to be heard. A temporary threshold shift usually disappears within 14-16 hours after over-exposure to loud sound. Cumulative over-exposure to loud sounds will eventually result in a “permanent threshold shift,” e.g., a permanent hearing loss.⁴

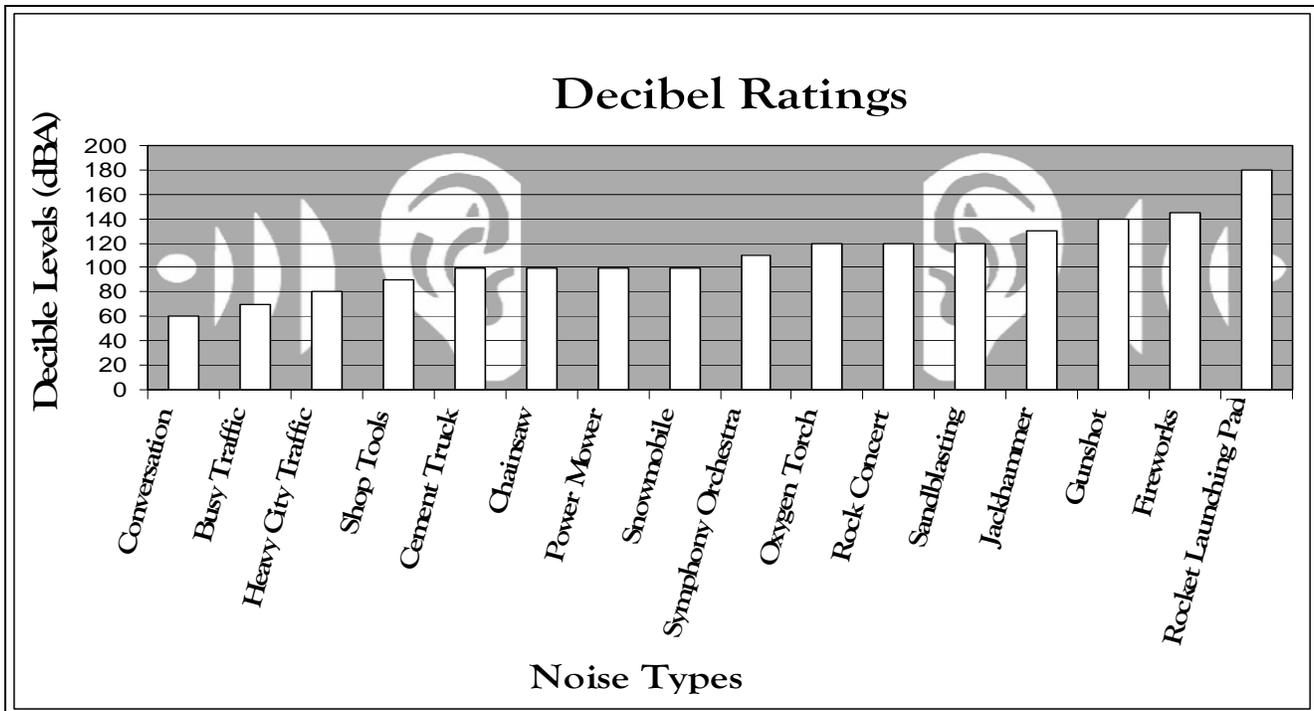
⁴ <http://www.hei.org/news/facts/nihlfact.htm>

Work Environment

“Many construction jobs, such as concrete work, site excavation, highway construction, and carpentry involve high levels of noise. Major noise sources include heavy equipment, such as loaders, dozers, and cranes, as well as tools like jackhammers and chipping guns. Excessive noise at construction sites not only causes hearing loss, but can create a safety hazard by masking the sounds of oncoming vehicles. Hearing loss and the use of hearing protectors by those with pre-existing hearing loss may further interfere with the workers’ ability to hear and perceive the sounds of danger.

Although these difficulties occur in many occupational settings, they are a particular problem in construction, where a variety of moving vehicles, back-up alarms, and other signals and activities may occur simultaneously.” In addition to wearing hearing protection, follow all recommended safety practices on and around the job site. ⁵

⁵ http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=FEDERAL_REGISTER&p_id=17368



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Resources

Reference OSHA standards 1910.95, 1926.101, 1926.52 for more information

www.dangerousdecibels.org/hearingloss.cfm

www.northensafety.com/services/guides/nrrs.cfm?UID=0

www.osha.gov/pls/oshaweb/owadisp.show

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