

Hearing Protection Guidance for Abrasive Blasting

Key Terms

- **NRR** – Noise Reduction Rating. It is a laboratory-derived numerical estimate of the attenuation that is provided by the protector.
- **Attenuation** - Attenuation refers to the damping or decrease of noise levels as a result of wearing Hearing Protector Devices (HPDs).
- **Suitable Hearing Protector** - The term "suitable hearing protectors" as used in the provision means protectors that are comfortable to wear and that offer sufficient attenuation to prevent hearing loss.
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=19154

OSHA Regulations

29 CFR 1910.95 is the standard for occupational noise exposure.

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9735

The employer must administer a continuing, effective hearing conservation program whenever employee noise exposures are at or above an eight hour time-weighted average (TWA) of 85 dBA or, equivalently, a dose of 50 percent. [29 CFR 1910.95(c)(1)] This is referred to as the action level. [29 CFR 1910.95(c)(2)]. See key excerpts of 1910.95 below:

1910.95(b)(1) - When employees are subjected to sound exceeding those listed in Table G-16, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels of Table G-16, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table.

1910.95(i)(1) - Employers shall make hearing protectors available to all employees exposed to an 8-hour time-weighted average of 85 decibels or greater at no cost to the employees. Hearing protectors shall be replaced as necessary.

1910.95(j)(1) - The employer shall evaluate hearing protector attenuation for the specific noise environments in which the protector will be used. The employer shall use one of the evaluation methods described in Appendix B: "Methods for Estimating the Adequacy of Hearing Protection Attenuation."

Excerpts from 1910.95 Appendix B (This Appendix is Mandatory)

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9737

Employers must select one of the following methods by which to estimate the adequacy of hearing protector attenuation. The most convenient method is the Noise Reduction Rating (NRR) developed by the Environmental Protection Agency (EPA). According to EPA regulation, the NRR must be shown on the hearing protector package. The NRR is then related to an individual worker's noise environment in order to assess the adequacy of the attenuation of a given hearing protector.

Instead of using the NRR, employers may evaluate the adequacy of hearing protector attenuation by using one of the three methods developed by the National Institute for Occupational Safety and Health (NIOSH), which are described in the "List of Personal Hearing Protectors and Attenuation Data," HEW Publication No. 76-120, 1975, pages 21-37. These methods are known as NIOSH methods No. 1, No. 2 and No. 3. The NRR described below is a simplification of NIOSH method No. 2. The most complex method is NIOSH method No. 1, which is probably the most accurate method since it uses the largest amount of spectral information from the individual employee's noise environment. As in the case of the NRR method described below, if one of the NIOSH methods is used, the selected method must be applied to an individual's noise environment to assess the adequacy of the attenuation. Employers should be careful to take a sufficient number of measurements in order to achieve a representative sample for each time segment.

From OSHA's etool on Hearing Conservation

ANSI published a new test method (subject-fit) for measuring the real ear attenuation of hearing protectors (ANSI S12.6-1997). This method provides more representative estimates of the real world performance of hearing protectors. It attempts to better approximate the protection attained in real workplaces by using untrained subjects in the test method (the only instruction they receive is the instruction that comes with the package) to closely replicate real world users. Some manufacturers of hearing protectors are testing their products according to the subject-fit method of ANSI S12.6-1997. You may contact the manufacturer to request such data.

Specifics to Abrasive Blasting

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Abrasive Blasting environments may subject workers to noise exposures in excess of 120 decibels across many different transmitted frequencies. Typical ear muff hearing protective devices will not meet the attenuation requirements using the NRR methods. In addition, helmet style abrasive blasting respirators make it difficult in many cases for a worker to wear an ear muff due to space constraints inside the helmet. This leads employers to look for other solutions. Typical approaches have included:

1. The use of double hearing protection (both an ear muff and an ear plug)
2. The use of a method other than NRR to evaluate the adequacy of the hearing protection attenuation, or
3. Include contributions in attenuation from the helmet itself.

The use of double hearing protection is difficult due to the previously mentioned space constraints and the allowable contribution of the second HPD is typically only 5 dBA. Solutions 2 and 3 in tandem are becoming more and more popular but is still difficult due to the equipment required to collect the necessary data. Employers wishing to use these solutions may contact the helmet manufacturer to request data, if available.

Bullard Specifics

88VX - The Air Force Institute of Operational Health has published data for the sound attenuation provided by the Bullard 88VX with just the helmet and also in conjunction with an earmuff. The Bullard 88VX helmet by itself had a NRR of 3 dB. The triple combination of the Bullard helmet, the Aearo/Peltor Tactical 6-S earmuffs and Heartech SilentEar earplugs had a NRR of 22 dB. Below is the link to the study:

http://airforcemedicine.afms.mil/idc/groups/public/documents/afms/ctb_051689.pdf

GenVX - Michael & Associates, Inc., State College, PA, were contracted to perform attenuation measurements on the Bullard GenVX helmet with cheek pads. The GenVX helmet, including cheek pads, had an NRR of 8 dB.

A copy of the study can be found at http://apps.bullard.com/files/RP_GENVX_HEARINGATTENUATIONREPORT_AM_EN_LOW_0000.pdf?1899596790

Examples

From: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=19194
https://www.osha.gov/dts/osta/otm/noise/hcp/attenuation_estimation.html

Question: How should a CSHO (Compliance Safety and Health Officer) calculate the hearing protector attenuation?

Answer: For a muff or plug, obtain the NRR (calculate the laboratory based attenuation using the IHFOM or NIOSH procedures, when no NRR is available for the protector). Since the noise dosimeter provides a TWA in dBA, subtract 7 dB from the NRR for spectral uncertainty pursuant to Appendix B in the hearing conservation amendment (HCA).

- Appendix B: Methods For Estimating the Adequacy of Hearing Protector Attenuation provides information on how to determine the adequacy of hearing protector attenuation using the noise reduction rating (NRR) of a given hearing protector.

Use the following formulas to estimate the attenuation afforded to a noise-exposed employee in a work environment by muffs, plugs, or a combination of both.

A common method used for single protection (either muffs or plugs) is as follows:

1. Determine the laboratory-based noise attenuation provided by the HPD. This is referred to as the Noise Reduction Rating (NRR) and is listed on the packaging.
2. Subtract the NRR from the C-weighted TWA workplace noise level, as follows:

Estimated Exposure (dBA) = TWA (dBC) - NRR

If C-weighted noise level data is not available, A-weighted data can be used by subtracting a 7 dB correction factor from the NRR, as follows:

Estimated Exposure (dBA) = TWA (dBA) - (NRR - 7)

Single Protection Example:

TWA = 100 dBA, muff NRR = 19 dB

Estimated Exposure = 100 - (19 - 7) = 88 dBA

This hearing protection is adequate if the employee does not exhibit STS or the employer is not invoking the van testing greater than 6 month testing option (1910.95(g)(5)(ii))

For dual protection (ear muffs and plugs are used simultaneously) use the following:

1. Determine the laboratory-based NRR for the higher rated protector (NRRh).
2. Subtract 7 dB from NRRh if using A-weighted sound level data.
3. Add 5 dB to the field-adjusted NRR to account for the use of the second hearing protector.
4. Subtract the remainder from the TWA as follows:

Estimated Exposure (dBA) = TWA (dBC) - (NRRh + 5), or

Estimated Exposure (dBA) = TWA (dBA) - [(NRRh - 7) + 5]

Dual Protection Example:

TWA = 110 dBA, plug NRR = 29, and muff NRR = 19 dB

Estimated Exposure = 110 - [(29 - 7) + 5] = 83 dBA

This hearing protection is considered adequate, as it is below the 85 dBA threshold.

Resources

OSHA Sample Hearing Conservation Program
<http://www.osha.gov/dts/osta/otm/noise/hcp/index.html>

OSHA Hearing Conservation etool
<http://www.osha.gov/dts/osta/otm/noise/index.html>

OSHA standard 29CFR1926.52 for occupational noise exposure specific to the construction industry
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10625&p_text_version=FALSE#1926.52%28b%29

OSHA letters of interpretation regarding 1910.95
http://www.osha.gov/pls/oshaweb/owasrch.search_form?p_doc_type=INTERPRETATIONS&p_toc_level=3&p_keyvalue=1910.95&p_status=CURRENT

Q&A surrounding OSHA's enforcement directives of 1910.95
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=19194

OSHA Office of Health Enforcement (202) 693-2190

NIOSH - 1-800-35-NIOSH, <http://www.cdc.gov/niosh/docs/98-126/chap6.html>

National Hearing Conservation Association (NHCA) Phone: (303) 224-9022, Website, Email OSHA Publication 3074 Hearing Conservation
<http://www.osha.gov/Publications/osh3074.pdf>

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