Hearing Protectors – Noise Reduction Rating

OSHA’s Noise Standards (1910.95 and 1926.52) do not want the use of ear plugs and ear muffs to be the employer’s sole means of protecting their workers. United Heartland always stresses that engineering controls should be implemented to effectively reduce the worker’s noise exposure below 90 dBA for an eight hour time weighted average (8 hr TWA). But, when ear plugs or ear muffs have to be relied on as the means to protect your employees, you need to know if the protection is adequate. Hearing protectors must reduce employee exposures to at least 90 dB, or 85 dB when an STS (standard threshold shift) has occurred. An STS would be identified through the audiogram given to employees (baseline or annual) who work in a noisy environment.

Two agencies have input concerning the hearing protectors—the American National Standards Institute in ANSI Z24.22-1957 (R1971) and ANSI S3.19-1974, and the Environmental Protection Agency (EPA) by requiring every manufacturer of ear plugs and ear muffs to provide a noise reduction rating (NRR) to their devices. The NRR is calculated under ideal conditions in a laboratory. Rarely are such protective hearing devices utilized under normal working conditions in an exact fashion as those utilized in laboratory settings establishing the NRR. To ensure that ear plugs and ear muffs offer sufficient protection, a safety factor can be built into the devices ensuring that they amply protect the workers. The Hearing Conservation Amendment (HCA), does not require employers to apply a 50% safety factor to the Noise Reduction Rating (NRR) when evaluating hearing protector adequacy, but it is recommended. In fact, applying this safety factor to protective hearing devices is outlined in the OSHA Technical Manual for compliance officers.

Field Attenuation of Hearing Protection
To estimate the attenuation afforded to a noise-exposed employee in an actual work environment by muffs, plugs, or a combination of both –
For muffs or plugs:
- Determine the NRR which should be on the packaging.
- Subtract 7dB from the NRR to correct for using A-weighted measurements.
- Adjust for workplace conditions by applying a safety factor of 50%. This is because the field use of ear protectors does not afford the same degree of protection achieved in the laboratory using well-trained subjects under ideal test conditions.

Example 1:
Noise Exposure: 98 dBA - 8 hr TWA
Ear Plugs NRR: 29 dB
Approximate field attenuation is: (29-7) x 50% = 11 dB
98 dBA - 11 dB = 87 dBA

For dual protection (i.e., muffs and plugs):
- Determine the laboratory-based noise attenuation (NRR) for the higher rated hearing protector.
- Subtract 7dB from the NRR.
- Apply a safety factor of 50%.
- Then add 5 dB to the field-adjusted NRR to account for the use of the second hearing protector.
Example 2:
Noise Exposure: 110 dBA - 8 hr TWA
Ear Plugs NRR: 29 dB
Ear Muffs NRR: 25 dB
Employer requires dual protection
Approximate field attenuation is: 
(29-7) x 50% = 11 dB
Add 5 dB to this field-adjusted NRR: 11+5 = 16 dB
110 dBA - 16 dB = 94 dBA

Conclusion:
Noise-induced hearing loss is the cumulative, permanent loss of hearing, always of the sensorineural type. This condition develops over months or years of hazardous noise exposure. This type of damage is irreversible. Developing methods to reduce noise levels (engineering controls) below the exposure level of 90 dBA should be your first objective. When methods are not available, providing the employee with hearing protection that will safely reduce their noise exposure under 90 dBA is the next step to take. Calculating the “safety factor” will ensure employees are not subjected to potentially damaging noise. Your Loss Control Representative can assist you in assessing your workplace noise exposure and develop methods to properly protect your employees.