TECHNICAL NOTE

THE USE OF SNR AND NNR FOR HEARING PROTECTION DECVICES / HEARING PROTECTION DEVICES RATING SELECTION METHODOLOGY

1 INTRODUCTION

A variety of simplified numeric attenuation ratings have been created to assist the occupational hygiene and safety practitioner to selection a hearing protection device that will allow for adequate noise attenuation for a specific application.

These ratings inform the practitioner on roughly how many decibels the noise will be reduced by when heard by an individual though the hearing protection device.

The two (2) most common of these attenuation ratings are **SNR** and **NNR**.

Both SNR and NNR are denoted by a number of decibels (dB). The higher the number the more protection it provides.

2 ATTENUATING RATINGS

2.1 Single Number Rating (SNR)

The Single Number Rating (SNR) is the European Unions (EU's) standard for showing the attenuation of hearing protection. SNR is used more frequently used by the United Kingdom (UK). The SNR for a specific product is determined by independent testing laboratories.

The SNR gives a rough estimate of the noise reduction offered by hearing protection products in decibels.

The SNR is often paired with another attenuation rating, called the HML Rating. The HML system attempts to give the user an idea of the attenuation provided by hearing protection at different frequencies, being high, medium, or low.

Unfortunately the SNR rating still gives a slightly inaccurate representation of the real-world performance of a given product. If the hearing protection id loosely fitting, the noise reduction won't be so effective.

The UK government's Health and Safety Executive (HSE) recommends applying a derating of 4 dB to the SNR rating. This means that a hearing protection device with an SNR rating of 30 dB would be expected to provide a noise reduction of 26 dB (i.e. 30dB minus 4 dB = 26 dB) in the real world.

2.2 Noise Reduction Rating (NRR)

The NRR is the noise reduction rating most commonly used by products manufactured in the United States. The NNR is determined through a series of tests that are d=conducted by the manufacturer instead of an independent testing laboratory.

The testing procedure is very clinical, ensuring that test subjects have their protection fitted properly. This then result in the test results overstating the real-work performance of the hearing protection device.

It is therefore required to apply a real-world derating value to the NRR value, to obtain a more accurate measure of the real-world performance of the hearing protection device.

This real-world derating value is calculated as (NRR value – 7) / 2

As an example, if the NNR number is 30 then the real-world derating value will be:
(30 – 7)/2 = 11.5

The estimated actual noise reduction will be 30 – 11.5 = 18.5 dB

3 OVER PROTECTION

The HSE recommends hearing protectors that reduce the level at the ear to below 70 dB(A) should be avoided, since this over-protection may cause difficulties with communication and hearing warning signals. Users may become isolated from their environment, leading to safety risks, and generally may tend to remove the hearing protection and therefore risk damage to their hearing.

The HSE provides an indication of the protector factor that is likely to be suitable for different levels of noise (the noise level during a particular work task, not the daily personal noise exposure), as per the table below:

Area Noise level – dB(A)	Select a protector with an SNR of …
85 – 90	20 or less
90 – 95	20 – 30
95 – 100	25 – 35
100 - 105	35 or more

4 CALCULATION EXAMPLE

The following example demonstrate how two hearing protection devices, with different ratings, can be evaluated for appropriateness of use in a specific working environment:

Indicator	Product A	Product B
SNR	30 dB	---
NRR	---	30 dB
Derating value	= Constant for all products = 4 dB	= (NRR value – 7) / 2 = (30 – 7) / 2 = (23)/2 = 11.5 dB
Estimated Actual Real-world noise reduction	= SNR – 4 = 30 – 4 = 26 dB	= 30 – 11.5 = 18.5 dB
Legislated Noise Exposure Limit	< 85 dB(A)	< 85 dB(A)
Working area assigned noise levels dB(A)	= 97 dB(A)	= 97 dB(A)
Estimated Actual Personal Exposure	= 97 – 26 = 71 dB(A)	= 97 – 18.5 = 78.5 dB(A)
Conclusion	Potential for over protection for some individuals.	Adequate protection, i.e. well below legislated limit value (85) and well above over protection value (70).

5 SOURCES AND REFENCES

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d) HSE - Noise: Hearing protection - overprotection. https://www.hse.gov.uk/noise/goodpractice/hearingoverprotect.htm. Sited 1 August 2022.
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