

The Selection of Hearing Protection

Introduction

Thank you for downloading 'The Selection of Hearing Protection' a short guide to help you with the selection of Hearing Protection at work.

Who is this article for?

This article is aimed at Health and Safety professionals who are responsible for providing hearing protection in the workplace, and need to become familiar with the process and the main methods of selection.

Selection of Hearing Protection: What's involved?

The selection of hearing protection for noise at work is a simple process as long as you have the right equipment and are competent in its use. There are three methods for predicting the overall attenuation or the effectiveness of hearing protection at your disposal. Each method is slightly different and range from the simplest to the highly accurate form of calculation.

- As a minimum, you will need an integrating Class 2 sound level meter, for example a Pulsar Nova Model 44, that can 'measure' LAeq and LCEq (not to be confused with Peak dBC).
- Importantly, you should only consider hearing protection that conforms to EN 352-1 and which comes with a Technical Specification that includes its 'Performance Numbers' as shown below.



Pulsar Nova Integrating sound level meter

H = 29	M = 23	L = 15	SNR = 25
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A simple process as long as you have the right equipment and are competent in its use!

Let's use a practical work example to highlight this.

You have carried out a number of noise measurements in a woodworking shop and need to recommend hearing protection for the various pieces of equipment. You now have a number of options as 'recommended' by the Health and Safety Executive with their 'Hearing Protection Calculators' (HPC).

So let's start by looking for hearing protection for the Woodworking Shop's Planer and Router that have been measured respectively with an LAeq of 90 decibels and an LCEq 95 decibels and an LAeq of 95 decibels and an LCEq of 97 decibels.

1. Hearing Protection Selection with the SNR Method (Single Number Rating)

If you use the SNR Method for the Planer, you need the measured LCEq plus the SNR taken from the Hearing Protector Technical Specification.

Insert manually these two figures into the HSE spreadsheet provided as shown. A figure of 74dB(A) appears in a green box which indicates that the Hearing Protection is adequate as it is below the Lower Action level of 80dB(A).

Had the box turned red, then this would indicate that the Hearing Protection would either be inadequate or would have over protected. In such a case, the wearer would not be able to hear warning sirens or instructions from colleagues.

You will note the 4dB 'real life' factor recommendation from the HSE. This is included to take into account the imperfect fit of the hearing protection and the directional nature of noise.

HSE Health & Safety Executive

SNR Method
You can use this method if you know the C-weighted noise levels

Data on the hearing protector

SNR

Noise levels

C-weighted noise level, L_c dB

Calculated level at the ear according to BS EN ISO 4869-2:1995 ($\alpha=1$) 70 dB

HSE recommends allowing 4dB for 'real-world' factors. Assume that this device will give: dB at the ear

Colour codes:

Protector gives adequate protection, and does not 'over-protect'

Protector does not give adequate protection, or it 'over protects'

Source: UK HSE website

2. Hearing Protection Selection with the HML Method (High, Medium, Low)

When using the HML method, you need both the measured LAeq and LCEq (not to be confused with Peak dBC) plus the H, M and L numbers taken from the Hearing Protector Technical Specification. These represent the value for the attenuation at high, medium and low frequencies. So, if we go back to the Router in the Woodworking Shop and the HSE spreadsheet for the HML method, you need to enter manually the following values:

HSE
Health & Safety
Executive

HML Method
You can use this method if you know both the A-weighted and C-weighted noise levels.

Data on the hearing protector		H	M	L
		29	23	15

Noise levels

A-weighted noise level, L_A	95	dB
C-weighted noise level, L_C	97	dB

Calculated level at the ear according to BS EN ISO 4869-2:1995 ($\alpha=1$)

	72	dB
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HSE recommends allowing 4dB for 'real-world' factors. Assume that this device will give:

	76	dB at the ear
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Colour codes:

- Protector gives adequate protection, and does not 'over-protect'
- Protector does not give adequate protection, or it 'over-protects'

Again, the hearing protection in this case gives adequate protection as the 76dB(A) figure is shown in green.

Quick reminder...

- The **selection** of adequate **hearing protection** is an important procedure but, provided that you have the right equipment and you use it competently, then there should be no problem in recommending the appropriate hearing protection.
- It is worth remembering though that hearing protection is the last resort. The priority remains to reduce the exposure to noise levels at source below the first action level 80dB(A) by different means.



3. Hearing Protection Selection with the Octave Band Analysis Method

For really noisy equipment with measured LAeqs consistently in the mid 90 decibels then Octave Band Analysis is the best method to use for the selection of hearing protection. This method is meant to be the most accurate way of measuring the effectiveness of hearing protection as it is looking at the actual frequencies of noise experienced by a worker. For this, you will need a sound level meter that is capable of measuring noise at octave bands centre frequency (in Hertz or Hz) such as the Pulsar Nova 46. In this case, the software that is supplied with this type of equipment will do all the work for you. Once the noise measurements are downloaded onto the computer, the software provided will analyse the data and generate automatically lists of suitable hearing protection such as shown below:

Arco	egard Premium Muff Lo	70.0	Muff EN 352-1	Ear Muff Overhead
Uvex	Uvex Whisper+ Detectable Re-usable plugs	70.1	Insert EN 352-2	Detectable Reusable Earplugs
Uvex	Whisper+ Re-usable Ear plugs - corded	70.1	Insert EN 352-2	Reusable Earplugs
Uvex	Uvex X-Cap Banded Ear Plugs	70.3	Insert EN 352-2	Banded Earplug
3M	EAR Cap Banded Ear Plug	70.4	Insert EN 352-2	Banded Earplug
Sperian Protection	PerCap Folding Banded Plugs	70.6	Insert EN 352-2	Banded Earplug
M S A	Left/Right Low Muff	70.7	Muff EN 352-1	Ear Muff Overhead
Uvex	100prs Uvex HiCom Earplugs Corded	70.7	Insert EN 352-2	Disposable Earplugs
Uvex	Uvex Hi-Com Ear Plugs	70.7	Insert EN 352-2	Disposable Earplugs
Sperian Protection	100 prs Howard LeightMatrixCordedEarPlug	70.9	Insert EN 352-2	Disposable Earplugs
Sperian Protection	Howard Leight Matrix Disposable Foam Ear Plug	70.9	Insert EN 352-2	Disposable Earplugs
Moldex	Comets 6420	71.1	Insert EN 352-2	Reusable Earplugs
Moldex	Mellows 7600	71.2	Insert EN 352-2	Disposable Earplugs
Moldex	Jazz-Band 6700	72.0	Insert EN 352-2	Banded Earplugs
Arco	egard re-usable Corded Ear Plugs	72.0	Insert EN 352-2	Reusable Earplugs
Sperian Protection	QB3 HYG Banded Ear Plug	72.2	Insert EN 352-2	Banded Earplug
3M	EAR Band Banded Ear Plug	72.5	Insert EN 352-2	Banded Earplug
M S A	MSA Left/RIGHT AM/FM Radio Ear Muff Blue	72.8	Muff EN 352-1	Ear Muff Overhead
Uvex	Whisper re-usable Ear Plugs	73.0	Insert EN 352-2	Reusable Earplugs
3M	EAR Ultrafit20 Ear plugs Corded	73.0	Insert EN 352-2	Reusable Earplugs
Arco	egard Banded Ear Plug	73.5	Insert EN 352-2	Banded Earplug
3M	EARsoft 21 Ear Plug	73.6	Insert EN 352-2	Disposable Earplugs
Sperian Protection	Howard Leight Clarity 656 Corded Plugs	73.6	Insert EN 352-2	Reusable Earplugs

Source: Nova Pulsar Analyser reporting software

Summary

So, when should you use these methods? Well, if the noise that you are intending to protect against is not tonal or dominated by low frequencies then the SNR method is fine for the selection of the appropriate hearing protection. The HML method takes some account of the frequency content of the noise but, if it is very tonal and/or has a large low frequency content, then octave band analysis should be used for the selection of hearing protection.

Pulsar Instruments offers a range of noise measurement equipment to help you with the prescription of hearing protection using the three main methods as discussed above.