Personal hearing protectors—Selection

Selection of hearing protectors

Hearing protectors are to be used for the purpose of reducing noise to a level where the risk of hearing damage is reduced, and, at the same time, allow the individual to hear instructions or warnings in the work environment.

Generally speaking the effect of wearing a hearing protector should be similar to if you were to cup your hands over your ears.

The primary criterion for selecting a hearing protector is that the level of noise entering our ears must be reduced to below the legal limits of the *Workplace Health and Safety Regulation 2008*, which are:

(a) an 8-hour equivalent continuous A-weighted sound pressure level of 85 dB(A), referenced to 20 µPa; or
(b) a C-weighted peak sound pressure level of 140 dB(C), referenced to 20 µPa.

The exposure limit under (a) basically means that if during an 8-hour shift the *average* noise level entering our ears is 85 dB or higher, we are exposed to excessive noise. The limit under (b) deals with impact noise (for example, such as noise from falling tools onto workbenches or the firing of nail guns) which, if exceeding the exposure limit, may create an immediate risk of hearing loss.

To select a hearing protector correctly we must first know which workers are exposed, what their exposure levels are and whether or not the hearing protector is compatible with the work environment and other protective equipment use.

A target “in-ear” noise exposure level must be set, e.g. 80 dB(A). Based on the noise exposure levels and the target level, the correct noise reduction of the hearing protector can be determined. Over-protection (attenuation) must be prevented to avoid feelings of isolation and communication problems leading to inconsistent wearing of the protector in noise. Reduction to below an “in-ear” level of 70 dB(A) should be regarded as over-protection. The area between 80 and 85 dB(A) could, because of uncertainties introduced by the “real world” ear protection, be regarded as potentially under-protecting. For good attenuation the “in-ear” noise level should generally be required to fall between 80 and 75 dB(A). Figure 4 below from European Norm EN 458 shows the areas for correct attenuation of hearing protectors.

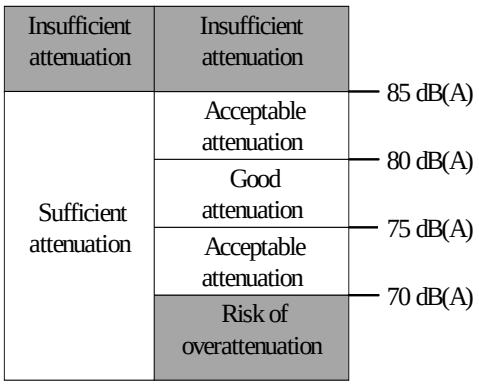

Figure 4:”In-ear” attenuation of hearing protectors

Hearing loss and a high attenuating hearing protector may hinder communication more than if we have no hearing loss and wear the same rated hearing protector. A hearing protector with a lower rating or a 'flat-attenuating' protector may be needed, provided it gives adequate protection. Professional advice may be needed with the selection. The benefit of a flat-attenuating hearing protector is that noise reduction is more consistent over the frequency range than industrial type hearing protectors and therefore causes less distortion at the higher frequencies which are the critical frequencies typically involved in noise induced hearing loss.

Hearing protectors should have been tested according to Australian Standard 1270. Test results are found on the packaging of the hearing protector. Results are normally stated as SLC_{80}, Class, or NRR. The three methods are briefly discussed.

The SLC_{80} method

The workplace noise is measured in C-weighted sound pressure levels as average over the shift, [$L_{Ceq,8h}$]. The SLC_{80} (Sound Level Conversion valid for 80% of the wearers) of the hearing protector indicates the difference between the measured C-weighted sound pressure level of the workplace noise *outside* the hearing protector and the A-weighted sound pressure level, attenuated by the hearing protector, under the hearing protector *inside* the ear canals.

For example the noise level in a workplace was 105 dB(C) (as average over the shift). The target "in-ear" noise level is 80 dB(A). The minimum SLC_{80} required for a hearing protector in this workplace would be:

SLC_{80} rating = 105 dB(C) - 80 dB(A) = 25

The class method

For this method we only need the 8-hour *average* value in dB(A) [$L_{Aeq,8h}$], to which the worker is exposed. AS/NZS 1269.3 lists noise level ranges for the five different classes of hearing protectors and their relationship to the above SLC_{80} rating, in Tables A1 and E1. A combination of Table A1 and E1 is shown below.

Table A1 and E1
AS/NZS 1269.3

Class	$L_{Aeq,8h}$ dB(A)	SLC_{80} Range
1	less than 90	10 to 13
2	90 to less than 95	14 to 17
3	95 to less than 100	18 to 21
4	100 to less than 105	22 to 25
5	105 to less than 110	26 or greater

For example, if a worker operating a four inch angle grinder is exposed to 98 dB(A) as average over the 8-hour shift [$L_{Aeq,8h}$ = 98 dB(A)], then a Class 3 hearing protector must be worn by that worker. The SLC_{80} rating of the hearing protector for the operator of the four inch angle grinder therefore must be between 18 and 21.

Noise Reduction Rating (NRR)

The NRR system is used in the USA, but is not acceptable in Australia as the method of testing is different from the AS 1270 test method.

More information

Further information is available from www.worksafe.qld.gov.au or by calling the WHS Infoline on 1300 369 915.