

REDUCED CONDITIONS ON AMBIENT NOISE LEVELS FOR IN-SITU AUDIOMETRIC TESTING

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The combined Australian/New Zealand Standard AS/NZS 1269.4:2005 *Occupational noise management, Part 4: Auditory assessment* is currently undergoing revision [1]. The main change to the Standard will be with the requirements for audiometric testing, viz: *Appendix C Maximum Permissible Ambient Noise Levels for Workplace Audiometry Programs (Normative)*. In effect the current version of the Standard has a device specific requirement. This is, that testing must be performed using one of several specified audiometric headsets. The revised version will be performance based, presenting the acoustic conditions, maximum permissible ambient noise levels (MPANL), required to reliably perform audiometric testing to within acceptable limits.

This article, based on work presented previously by one of the authors [2], was prompted by enquiries received within the public comment phase during preparation of the revised Standard, requesting information on the attenuation performance when insert-earphones are used in combination with an earmuff. Such a combination with its increased attenuation possibilities, allows audiometric testing in higher ambient noise than is currently possible with either earphones or insert-earphones alone. The ability to use the insert-earphone/earmuff combination with increased attenuation means that audiometric testing can be carried out at a variety of locations where previously a portable test booth may have been required.

This is particularly significant when travel to distant or difficult-to-access sites may be involved such as remote communities and isolated mining sites. Many permanent

regional or urban based locations also experience difficulties, particularly in the lower frequencies, from ambient noise produced by large, high volume, air-conditioning systems.

A particular combination of insert-earphones and earmuff as shown in Figure 1 has been tested by National Acoustic Laboratories (NAL) in accordance with the requirements of AS/NZS 1270:2002 *Acoustics – Hearing protectors* [3]. The test results are presented in Table 1.



Figure 1. MSA 766243 High Profile Earmuff and ER-3A insert earphones

These attenuation values may be used to calculate the maximum permissible ambient noise levels in octave-bands required to test in accordance with the revised Standard. The procedure follows that outlined in ISO 8253-1:2010 [4] and Williams [5]. These attenuation values will easily be reached when the insert-earphones

Table 1. Mean octave-band and overall attenuation values provided by the combination of ER-3A insert earphones in combination with an MSA 766243 High Profile Earmuff [1]

| Frequency | Attenuation (dB) at octave-band centre frequency (Hz) | | | | | | |
|-----------|---|------|------|------|------|------|------|
| | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| Mean | 35.3 | 40.7 | 49.5 | 43.9 | 37.2 | 49.0 | 45.0 |
| SD | 8.3 | 6.4 | 7.2 | 6.1 | 4.4 | 4.7 | 5.6 |

and earmuffs are well fitted by the tester. With judicial fitting attenuation above the mean can be expected. The use of the MSA 766243 High Profile Earmuff enclosure allows for sufficient room to cover the ER-3A inserts without impeding the ER-3A performance while the large volume provides better attenuation at low frequencies as compared to enclosures with less volume. (Note: It must be ensured that the tubing connected to the ear-insert is in no way bent or crushed during use.)

This information and attenuation data will be of interest to those who supply audiometric test services and associated equipment.

REFERENCES

[1] Australian/New Zealand Standard AS/NZS 1269.4:2005 *Occupational noise management, Part 4: Auditory assessment*, Standards Australia, Sydney, 2005

[2] M. Fisher, B. Rudzyn, G. Jarvis and H. Dillon, "Improved hearing assessment accuracy in noisy environments", *Proceedings of the Audiology Australia XX National Conference 2012*, Adelaide, Australia, 1-4 July 2012

[3] Australian/New Zealand Standard AS/NZS 1270:2002 *Acoustics – Hearing protectors*, Fifth edition, Standards Australia, Sydney, 2002

[4] ISO 8253-1:2010 *Acoustics - Audiometric test methods - Part 1: Pure-tone air and bone conduction audiometry*, International Organization for Standardization, Geneva, Switzerland, 2010

[5] W. Williams, *The calculation of maximum permissible ambient noise levels for audiometric testing to a given threshold level with a specified uncertainty*, NAL Report No. 133, National Acoustic Laboratories, Sydney, 2010 <http://www.nal.gov.au/pdf/NAL%20Report%20133%20-%20The%20calculation%20of%20B-G%20noise%20for%20audiometric%20testing.pdf>

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