A NEW CSA HEARING PROTECTION STANDARD

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1 Introduction

The first CSA hearing protectors' standard was published back in 1965. Since then, there have been 6 editions, the last being issued in 2002. Right now, a new edition has just gone through a mandatory Public Review as *"Z94.2-14 Hearing Protection Devices – Performance, selection, care and use"*. It is presently being prepared for final review and approval, appearing probably before the year-end. The reason for that many updates has been the fact that the industry has greatly improved their product. There have been further advances in the way protectors are tested and the way test results are used for calculating the noise level of the protected ear. The biggest problem has been (and is still) how to equate the lab testing results with real life situations, where the attenuation is always lower.

While preparing the present edition, the writing Subcommittee has taken interest in certification of hearing protection devices (HPDs). Although the final document doesn't call for certifying the devices, the language has been prepared so that certification could be introduced in a later edition without major changes in the document.

This edition expands on performance requirements and rating schemes to help the user select the device most appropriate for a given work situation. It now includes a de-rating scheme for the widely used Noise Reduction Rating (NRR) designed to obtain more reliable estimates of the noise level of the protected ear. The potential use of field attenuation estimation systems (FAES) is also introduced.

2 Main Issues

Some of the outstanding issues in this standard are:

2.1 Attenuation Testing

Two testing methods are included in the standard. The first one is the Experimenter-fit real-ear attenuation, ANSI S3.19 -1974. It is needed for the calculation of NRR and for determining the Class of a protector.

The second is the Subject-fit real-ear attenuation, ANSI/ASA S12.6–2008, Method B (inexperienced subjects). Results from tests following this method are used for the calculation of $SNR(SF_{84})$, a rating proven to be closer to what is found in real life situations.

2.2 Protectors' classification
A) Class

A Class is assigned to a protector using results from ANSI S3.19 test results. This classification is kept mainly because it is included in some provincial legislation and also used by manufacturers and users alike. The Standard recommends the use of different classes for different ranges of noise exposure levels, making easy the choice of a class.

B) NRR

The most popular classification has been and still is the NRR (Noise Reduction Rating). The two main reasons are: a) the requirement by the USA EPA to have it written on the protector's package and b) the ease of calculating the noise level of the protected ear. It has been criticized because of the overly optimistic value, due mainly to the way the testing is done (using the ANSI S3.19-1974 method). Because the field attenuation is smaller than the lab results, the standard includes one scheme for de-rating of NRR, including several examples of its application.

C) SNR(SF84), Single Number Rating (Subject Fit 84th Percentile)

This is the same rating included in the previous issue of the standard. It is calculated using results from test done following ANSI S12.6 standard Method B that uses naive subjects. It has been demonstrated that sound levels of the protected ear calculated using that particular rating, approximate closely to those obtained in real life situations.

D) Octave-Band Computation

This computation was also included in the previous standard. It is the most complex of the four methods described above. It requires the ambient noise level to be measured in 1/1 octave bands, something easily done with the modern instrumentation. This method provides the greatest potential accuracy. It is recommended to be used every time the 8-hr equivalent noise exposure level exceeds 105 dBA.

2.3 Selection of Hearing Protectors

The Standard includes three methods of selecting HPDs based upon noise levels and the method the attenuation data has been obtained. In order of increasing potential accuracy, the methods are:

Use of classes, which pre-assigns the HPDs according to defined attenuation ranges

Use of single number such as NRR or SNR(SF84), and

Use of the octave bands approach.

Several tables in the document help the user select the best protector for a given noise environment.

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2.4 Specialized HPD

The Standard describes a new family of devices, intended to overcome some undesirable consequences of the use of the conventional HPDs, such as speech intelligibility and signal detection reduction, especially for people with hearing loss.

Those devices can be divided into two categories: active and passive. The active protectors make use of electronic circuitry to reduce the noise at the ear. In the passive protectors, the attenuation characteristics are altered using mechanical means.

Active protection devices included in the Standard are: noise-attenuating communication headsets, HPDs with direct music input, active noise reduction (ANR) and sound restoration devices.

Passive devices included are those with flat or uniform attenuation, frequency-sensitive protectors, adjustable-attenuation protectors and amplitude-sensitive (level-dependant) devices.

2.5 Fit, care and use of protectors

The Standard examines in details the importance of a proper fit and how to obtain it through proper training. The same applies to the way they are been taken care of, since keeping them in good shape is essential for obtaining the results that are expected.

2.6 Implementation of hearing protection devices

A section in the document is dedicated to the development and implementation of a hearing protection program that should include periodical training. It should also take care of posting of areas that may be hazardous and where the wearing of HPDs is compulsory.

Mention is made to the CSA Z1007 standard *Management of hearing loss prevention programs* that deals in details with those issues.

2.7 Filed Attenuation Estimation Systems (FAES)

FAES are devices used to test the attenuation obtained by an individual in a real situation. They intend to answer the fundamental question in hearing conservation practice: what amount of protection is a given individual really getting from his or HPD.

Fit testing reflects what a user can achieve and has been shown to achieve at the time of testing, and not necessarily what the user truly achieves day-to-day.

Fit testing systems may be used to help individuals to:
• Properly select their HPD
• Fit their selected HPD most effectively
• Learn consistency in the fitting of their HPD
• Spot-check the fit of their chosen HPD
• Estimate protected exposure levels

The result of testing using FAES is the so-called PAR (Personal Attenuation Rating). It is a single number that subtracted from the noise exposure of the worker estimates the noise exposure of the protected ear.