INCE Publication 05-1 "A Global Approach to Noise Control Policy" [1]

Alberto Behar[1] and Tim Kelsall[2]
1 - IBBME, University of Toronto, behar@sympatico.ca
2 - Hatch Associates, Mississauga, Ontaio, tkelsall@hatch.ca

1. INTRODUCTION

The International Institute of Noise Control Engineering (I-INCE, http://www.i-ince.org/), founded in 1974, is a worldwide consortium of organizations concerned with noise control, acoustics and vibration. It is the sponsor of the INTER-NOISE Series of International Congresses on Noise Control Engineering and the co-sponsor of symposia on specialized topics within the I-INCE fields of interest. I-INCE and the Institute of Noise Control Engineering of the USA (INCE/USA) jointly publish the quarterly magazine "Noise/News International". In 1992, I-INCE instituted a program to undertake technical initiatives on critically important issues of international concern. This initiative has resulted in three reports and the creation of five ongoing Technical Study Groups (TSG).

The Draft Report "A Global Approach to Noise Control Policy" (called "the document" further in this article) was produced by TSG No 5. Like all other TWGs, it comprises members from different Member Societies.

The Report was to be presented at the General Assembly Meeting scheduled for August 7, 2005. It has been circulated for comment and approval by the I-INCE Member Societies, one of which is the Canadian Acoustical Association. This request was considered at a CAA Board of Directors meeting held in Vancouver in May 2005. There, it was decided not to endorse the Report, but to circulate it among the CAA members for their information. The main reason for the decision was that the Association does not have an established protocol for review and endorsement of such documents.

The aim of the Report is to underline the fact that in this era of globalization and international trade, noise has become an international issue now that manufactured products are exported worldwide. If noisy, they create problems not only to consumers within the country of origin but also to inhabitants of the countries to which they are exported. Those problems can be occupational, if products are used for manufacturing or transportation. They can also be environmental if they are radiating noise to the environment. For those reasons, the authors of the document concluded that noise control policies have to be coordinated worldwide to ensure uniformity in the way noise is controlled.

The Report is divided into five sections:

- General
- Occupational noise
- Community noise
- Consumer product noise, and
- Summary of I-INCE positions

A complete analysis of the Report would be almost as extensive and time-consuming as the document proper and hence the current review deals only with the section on Occupational noise.

It must be pointed out that the comments herein are that of the authors and is not a reflection of the CAA position.

2. PART 2: OCCUPATIONAL NOISE

2.1 Introduction

As stated in the introduction of the document, Part 2 is largely based on the I-INCE publication 97-1 [2] . It provides I-INCE recommendations for action to alleviate damaging exposures to noise in the workplace.

The document points out three main reasons for the failure to conserve hearing of noise exposed workers, even in the most developed countries. They are:

a) Over-reliance of the use of hearing protectors as the only hearing conservation measure,

b) Lax, irregular or non-existent legislation regarding hearing conservation and

c) Inadequate or non-existent application of noise control engineering techniques in the design of industrial buildings and machines.

The document states that the most important factor for reducing hearing losses is the engineering noise control that should take priority in any hearing conservation program. A necessary element to it is the institution of regulations at a national level specifying noise exposure limits [3].

To these reasons, the authors would like to add:

- Lack of instruction and awareness among workers
- Lack of strict enforcement of existing noise exposure limits,
- Lack of adequate and knowledgeable review of occupational noise controls before plants are permitted to be constructed or retrofitted, and
- Lack of standards for noise control design of industrial facilities

2.2 Terms and definitions

Section 2, Part 2, refers to terms and definitions in the document and there is a surprise: when dealing with noise exposure, the authors have chosen to use the term "Sound (noise) exposure" expressed in Pa^2h instead of the now commonly used term "A-weighted equivalent sound level", Leq (dBA) or the "Normalized A-weighted noise exposure level", LEx (dBA).

This is rather odd, since:

a) Sound level measurement results are invariably expressed in terms of sound pressure level (dB) and not as sound pressure (Pa).

b) Most instruments measuring sound exposure, (at least on this side of the ocean) show their results in terms of noise exposure (Leq, Lex or LOSHA), or some times noise dose (%), but certainly not as noise exposure (Pa^2h).

c) National and international standards such as Z107.56, ANSI S12.19 or ISO 1999 use the term Leq. Even the most recent draft of CSA Z107.56 has eliminated the term Pa^2s in the text. [4, 5, 6]

d) The ISO WG 53, working Draft standard on noise exposure measurements, also specifies A-weighted Leq and LEx as the terms to be used. Again, the term Pa^2h is not even mentioned [7]

A serious omission in the section is the term "Noise Immission". Although used in the text, it is not defined.

2.3 Effects of Noise

The Report reviews the issue of noise as a cause not only of noise induced hearing loss but also of masking of safety signals. It also points to the fact that high noise levels are stressful, tiring and unpleasant. The Report concludes that the introduction of policies requesting the use low-noise level machines and equipment in the workplace will eliminate the above-mentioned effects.

2.4 Issuing authorities and international non-governmental organization

Here the Report presents nine different entities dealing with noise, beginning with the European Union down to I-INCE. It describes what they are, including some pertinent information. A list of the websites would have been most useful, but, unfortunately is missing. Missing are other important organizations, such as the FIA (Iberoamerican Federation of Acoustics). It is not clear why the EU is singled out while other federal authorities (e.g. Washington or Ottawa) are not referred to.

2.5 Immission specifications (Section 6)

The term "Immission", a term rarely used nowadays, deals with the sound level at the point of reception or receiver. This is a descriptor needed to assess the risk of hearing loss and should be specified, as it is used in the report.

The Report recommends an upper limit of 85 dBA time-averaged sound level, something most jurisdictions have already adopted. However, it still mentions the noise exposure limit of 1 Pa^2 h and even provides a formula for transforming this limit into noise exposure level for a given exposure duration.

For impulse noise it recommends an upper limit of 135dB, C weighted peak sound level, (interesting, no sound pressure but sound pressure level is used here). The reasons for limiting the peak level for hearing conservation purposes have been for the longest time a controversial issue. It is a well known fact that hearing loss from impulse noise is dependant not only of the peak level, but also on the rise time, decay time, frequency content, number of impulses and duration of the exposure. However, the exact limits for the above variables are still very much debated.

Only the peak value is ever specified in regulations/specifications/standards that these authors have had access to. The limit most frequently is set at 135 or 140 dBC. Those levels are equivalent to an Leq of 85 dB for durations of approximately 0.3 and 0.1 s respectively. For such short duration sounds the A and C weightings will likely give similar results. Thus for any practical purposes, in the workplace, especially because of the reverberant characteristic of the environment, the presence of impulsive noise will likely cause the limit of LEx = 85 dBA to be exceeded before the 135 dBC limit can come into effect. Thus the latter is not necessary. One would expect at least a mention that the use of the 135 dB Peak is a very crude, approximate way of assessing the risk from impulse noise.

In addition, there is a problem that the 135/140 dBC limit causes the practicing noise control engineer who uses a dosimeter to assess the noise exposure of a worker. If, by any chance, there has been even a single clap of the hands or the microphone cable has rubbed on clothing during the measurement period, the instrument will often show that the peak level limit has been exceeded. The obvious conclusion will be that the worker was over-exposed, even if the measured Leq was below 85 dBA. The net effect of this "use" of the peak level limit is, therefore, a false positive risk assessment.

It is surprising that the document recommends engineering controls to be implemented only when the hazard limits are exceeded. This is in contradiction with current industrial hygiene practice and many hearing conservation programs that introduce the concept of "action level" a level, lower than the limit, when some action must be taken.

2.6 Emission specifications (Section 7), Path control specifications (Section 8)

Those two sections repeat concepts found in most hearing conservation and noise control texts. There are also some repeats from the previous sections.

2.7 Noise control engineering actions required in an operating industrial enterprise (Section 9) and Follow-on actions (Section 10)

These should probably be the most important sections of the document. Unfortunately this is not the case. The steps to be followed and actions recommended are those well known by any industrial hygienist, and too general for a noise control practitioner.

It is surprising that even the reference to a hearing conservation program is taken from a chapter of a book written almost 15 years ago [8] when there are many more books on such an important issue that could have been quoted [9].

Two more issues that should have been included in this sections are:

a) New and retrofit facilities should undergo knowledgeable and independent review for noise control design prior to permitting their installation. This approach has proven quite effective in environmental regulation.

b) There should be standards for design of new and retrofit industrial facilities, including minimum criteria for reverberation, prediction of sound levels and employee noise exposure, effective use of noise emission declarations and the quality control required to provide effective results.

3 CONCLUSIONS

The INCE initiative is clearly worthwhile and any document that will help all countries and industries adopt up to date criteria is useful. While the criteria proposed are currently used by many well informed countries, they represent the state of the art of perhaps a decade ago. These days, Pa^2h is virtually unused and there is growing recognition that peak levels have limited use in a regulation (although widely used). Finally, many industries are already aiming for levels lower than 85 dBA.

At the same time, there is a real need for unifying criteria around the world. If this document can promote the criteria it suggests towards universality, it will have accomplished a good deal.

4 REFERENCES

1 Noise Control Eng. J. 52 (6), 2004 Nov-Dec (251-298)

2 I-INCE Publication 97-1, Technical Aspects of Upper Limits on Noise in the Workplace, T.W.F. Embleton, Ed., NOISE/NEWS International, 5(4), 203-216 (1977)

3 This does not take into account countries like Canada where this would be unconstitutional (even though it might indeed be simpler).

4 CSA Z107.56: Procedures for the Measurement of Occupational Noise Exposure. It has to be noted that the original version of this Standard did contain the term Noise Exposure and explained how it could be converted to Leq. In the latest draft, the term was dropped because of the lack of application and use.

5 ANSI S12.19-1996, Measurement of Occupational Noise Exposure.

6 ISO 1999:1990 Acoustics - Determination of occupational noise exposure and estimation of noise-induced hearing impairment

7 ISO/WD 9612 Acoustics – Measurement and calculation of occupational noise exposure – Engineering method.

8 Larry H. Royster and Julia D. Royster, "Hearing Conservation Programs" Chap.22 in Handbook of Acoustical Measurements and Noise Control, edited by Cyril M. Harris, 3rd ed.,(McGraw-Hill, Inc., New York, NY, 1991)

9 As an example see Alice H. Suter: "Hearing Conservation Manual" Fourth Ed., CAOHC, Milwaukee, NY, 2002.

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"Hugh Jones wishes to make you aware of the website www.stuns.info"