

3. Foss's theory gave better predictions of the double barrier attenuations than did the equivalent single wall theory.
4. The average performance of double barriers, with the ground effect, increases as the distance between them increases.

Acknowledgement

All the experimental work was done under the supervision of Dr. J.S. Bradley in the Sound and Vibration Laboratory at The University of Western Ontario. I would like to express my gratitude to Dr. J.S. Bradley for his guidance and advice.

References

1. "Modelling Environmental Sound Propagation". J.S. Bradley and C. Hugh. CAA meeting, Windsor (1979).
2. "Double Barrier Noise Attenuation and a Predictive Algorithm". R.N. Foss. Noise Control Engineering, Vol. 13, No. 2, pp. 83-90 (1979).
3. "Noise Reduction by Barriers on Finite Impedance Ground". T. Isei, T.F.W. Embleton and J.E. Piercy. J. Acoust. Soc. Am., Vol. 67, pp. 46 (1980).
4. "Highway Noise Barriers: New Shapes". D.N. May and M.M. Osman. J. Sound and Vib., Vol. 71, No. 1, pp. 73-101 (1980).

CANADIAN ACOUSTICAL ASSOCIATION
ANNUAL MEETING MONTREAL
OCTOBER 22 - 24, 1980

SUMMARY OF SESSION ON MEASUREMENT AND PROTECTION OF HEARING IN INDUSTRY

Thursday a.m., November 23rd, 1980

Chairman: A.Behar

Seven papers were presented in this session. Abstracts for the first six of these are as follows: --

COMPUTERIZED AUDIOMETERS FOR
INDUSTRIAL AUDIOMETRY

by

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Current and proposed legislation specify that for compliance purposes, a minimally effective Occupational Hearing Conservation Program consists in part, of the following.

1. A baseline audiogram for all employees exposed to noise levels equal to or in excess of the standard.
2. Periodic audiograms for each overexposed employee.
3. Analysis of audiogram's with retesting and/or referral to an Otolaryngologist or qualified physician when a significant threshold shift occurs.

These requirements provide a clue to the enormous amount of data generated by the audiometric component of a hearing conservation program. The task becomes gargantuan if manual techniques are used to: test a large number of employees each day, generate written records for each test, separately analyze each test result and produce the necessary report. The purpose of this paper is to present an electronic data processing approach designed to facilitate analysis of audiometric data obtained from a hearing conservation program.

ATTENUATION OF HEARING
PROTECTORS AND THE NRR

by

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The Noise Reduction Rating (NRR) was adopted by the Environmental Protection Agency (USA) in September, 1979, as a single number to assess noise attenuation of hearing protectors. By subtracting the NRR value from an existing noise level the result is supposed to be the dBA level of 98% of the protected population. This is a fast method to be used instead of the so-called "long" method recommended by OSHA. Another advantage of the NRR is that it avoids the need of an octave band measurement of the existing noise, by simply measuring the dBC level. (That of course, requires the use of a SLM with the dBC weighting network.)

This paper compares dBA levels of the protected ear as obtained by using both the NRR and the "long" methods.

Six different type of noises were used, three artificial and three existing. They all were "applied" to six hearing protectors: two muffs, three plugs and one semi-insert.

The results can be summarized as follows:

- a) dBA levels obtained by using the NRR are always higher than by using the "long" method.

b) This difference changes with the type of protector as well as with the spectrum of the particular noise.

Although the mean value of those differences was 3.5 dBA, individual differences were found to be as high as 9.0 dBA.

Because of the better protection obtained by using the NRR and of the simplicity of its use, its application for industrial hearing conservation programs is strongly recommended.

SPEECH INTELLIGIBILITY IN NOISE WITH EAR PROTECTORS

Sharon M. Abel, Ph.D.;
Peter W. Alberti, M.B., Ph.D.;
F.R.C.S., F.R.C.S.(C);
Caroline Haythornthwaite,
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This research investigated the effect of ear protectors on the intelligibility of speech in noise. The listeners were adults, 35-65 years old, with normal hearing, bilateral high frequency or flat loss between 500 and 4000 Hz. Half the subjects were fluent in English and half had learned English as a second language and were poorly conversant. Taped lists of 25 words were presented free field under a variety of conditions in which the signal-to-noise ratio (+5 and -5 dB), the spectrum of the background noise (white versus crowd), and the presence of ear protection were varied.

The data indicated that in normal listeners the number of

words correctly repeated decreased as the signal-to-noise ratio decreased and that speech perception was poorer in noise than in quiet. For no combination of noise background and amplitude of speech did the protector have an effect on intelligibility. In marked contrast, subjects with either a noise-induced, high frequency or flat loss showed a substantial protector effect. For all hearing categories, non-fluency with the English language contributed an additional decrement of 15 to 20 percent, but this was independent of the particular conditions for listening. Significant differences in performance were noted for different muff and plug types.

AGE-EFFECT CORRECTIONS IN IDENTIFICATION AUDIOMETRY AMONG NOISE EXPOSED WORKERS

by

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An epidemiological procedure for the classification of results from screening audiometry among noise exposed workers is proposed. It relies essentially on (a) the identification of the workers suffering from a hearing loss of an extra-occupational origin and (b) the estimation of the proportion of workers showing noise-induced hearing losses greater than that attributable to age-effect in at least 90 per cent of the population. Available age-effect data will be discussed

in terms of the sensitivity and specificity of the classification procedure as it is applied to an industrial population.

THE ACCURATE QUANTIFICATION
OF INDUSTRIAL HEARING LOSS

by

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Industrial hearing loss in Canada is compensated on rating scales based on puretone audiometry. Accurate puretone quantification of hearing loss is therefore a matter of significant interest of Workmen's Compensation Boards. A number of factors, however, exist which can contribute to audiometric error: inherent variability in psychoacoustic test, instrument calibration errors, test environment errors, technical errors in administering the audiogram and a variety of patient factors including learning, fatigue and deliberate exaggeration can all affect audiometric test results. This paper will discuss clinical techniques used to accurately quantify industrial hearing loss and some of the audiometric findings in a large group of workmen seen for the Workmen's Compensation Board of Ontario.

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THE AUDIOMETRIC TEST PROGRAM
AT INCO METALS COMPANY

by

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The Ontario Division of INCO Metals Company commenced implementing a formal hearing conservation program for its employees in 1965. The audiometric test program for all employees has been an integral and important part of this program since its inception. It includes an annual screening survey with open discussion of test results with individual employees. Employees who are found to have problems are interviewed and may be given further tests which include impedance and speech discrimination. Those employees requiring diagnostic service and treatment are referred to appropriate medical authorities including a consulting otolaryngologist.

This paper describes INCO's audiometric test program and provides an assessment of its results.

(Continued on page 52)

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