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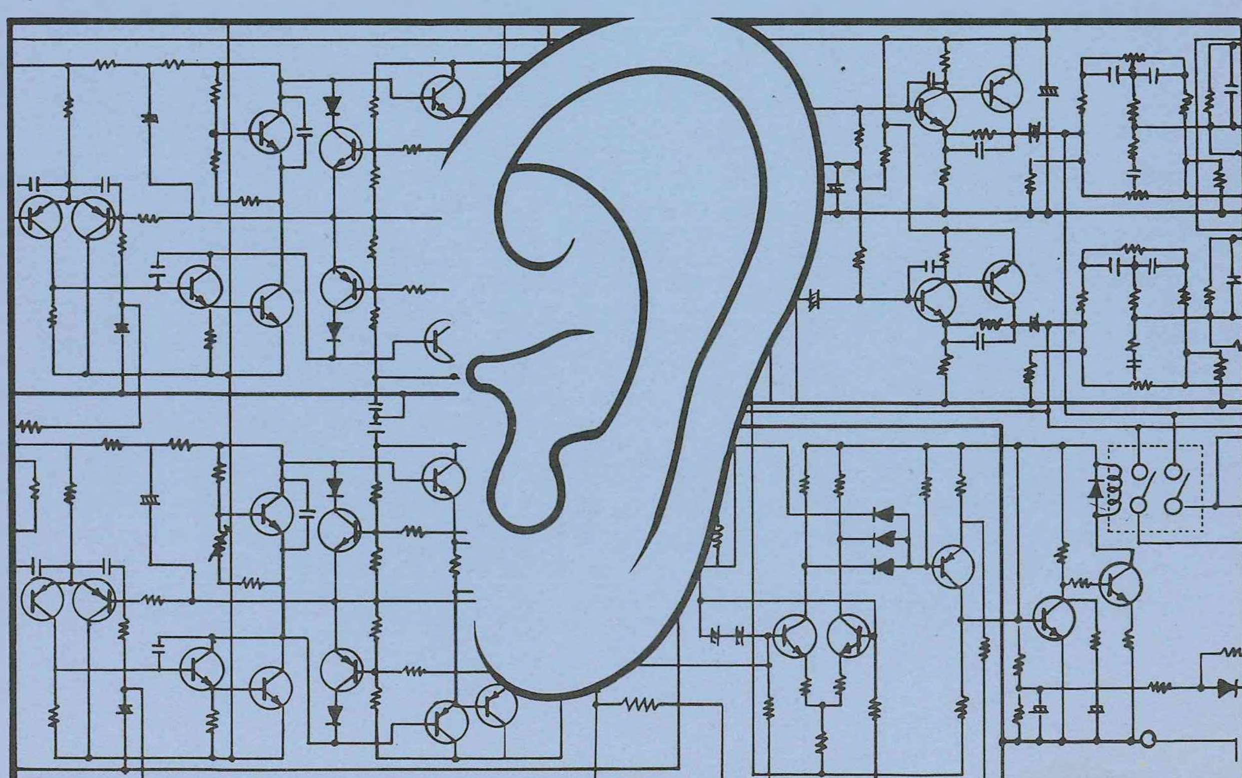

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Prix: $4.00 (affranchissement inclus)

Articles on all aspects of Acoustics and Vibration in English and French are welcome, and should be addressed to any editor. All papers are reviewed.

Vous êtes invités à soumettre des articles sur tous les domaines de l'Acoustique et des Vibrations, en français ou en anglais. Prière de les envoyer à un des rédacteurs. Tout article est révisé.

EDITORIAL

After five years of considerable efforts, Dee Benwell and Moustafa Osman have retired from their positions as editors. We certainly owe them many thanks for their successful struggles to increase the quality and visibility of CANADIAN ACOUSTICS.

Your new editors hope to continue to improve CANADIAN ACOUSTICS, and any suggestions that you might have would be most welcome. For example, for several hundred dollars per issue, we could have the entire issue type set and greatly improve the appearance.

To increase the quality we need your contributed papers. Remember, we are a refereed journal, and what better way to communicate to the Canadian acoustical community than in CANADIAN ACOUSTICS. We are also happy to publish letters, especially when they stimulate interest in acoustical topics.

Improved presentation and increased advertising revenue would readily follow increased circulation. Partly this involves getting new CAA members with a broader range of acoustical interests. Annabelle Cohen has taken on the job of expanding our membership and we wish her success. If this is not your copy of CANADIAN ACOUSTICS, you really should become a member and get your own copy! Finally, there is the question of library subscriptions. Does your library subscribe to CANADIAN ACOUSTICS? Please encourage them to do so.

Our annual meeting and seminars in Vancouver were quite successful, highlighted by the after dinner presentation by Bill Swanson. We now know how the C sharp diminished chord holds our country together. Where would we be without acoustics?

EDITORIAL

Après cinq ans de travail assidu Dee Benwell et Moustafa Osman ont résigné leurs fonctions de rédacteur. Nous sommes certains que tous les membres se joignent à nous pour les remercier d'un travail bien fait. La qualité de l'ACOUSTIQUE CANADIENNE s'est visiblement améliorée grâce à leurs efforts.

Vos nouveaux rédacteurs espérons continuer dans cette même voie. Cependant la qualité de notre journal dépend aussi de votre participation active. Tous les articles sont arbitrés et ainsi nous vous incitons à communiquer les résultats de vos travaux à vos confrères par l'entremise de l'ACOUSTIQUE CANADIENNE.

Si nous pourrions augmenter la circulation, ceci stimulerait peut-être la vente de pages publicitaires additionelles. Avec quelques centaines de dollar de plus nous pourrions avoir l'ACOUSTIQUE CANADIENNE composé professionnellement. Vos commentaires à ce sujet seraient appréciés.

Présentement Annabelle Cohen s'occupe d'augmenter les membres de l'association et nous lui souhaitons bonne chance. Si ce numéro que vous lisez n'est pas le vôtre, pourquoi pas devenir membre et recevoir votre copie personelle. Nous vous encourageons aussi à demander votre bibliothèque de s'abonner.

En terminons nous voulons profiter de l'occasion pour vous souhaiter une bonne et heureuse année.

TORONTO REGIONAL CHAPTER MEETING

Date: 29 November 1983, 7:00 p.m.
Ontario Hydro Commission Auditorium
Theme: Architectural Acoustics
Chairperson: Sharon Abel
Convenors: Sharon Abel and Alberto Behar

The following speakers each gave a 20-minute presentation, followed by a Question and Answer period.

Professor L. Doelle, Acoustical Consultant
Topic: "Acoustics and the Architect"

A slide presentation of many "do's and don'ts" in site planning, construction methods and examples of general deficiencies in acoustics. Quite often we see that acoustical consideration is given after a building is already in use and complaints are presented. He sees, however, a situation that is improving with recent graduates in Architecture having had a better training in acoustics.

Mr. John Hemmingway, Manager - Technical Services, Decoustics Ltd.
Topic: "Architectural Acoustics from Concept to Reality"

Emphasis on sound control within a room, construction of absorption panels and strategic locations of panels and modules in reverberant areas. A number of excellent slides of the new Thompson Hall were presented, showing us the blending in of acoustical modules and panels with the decor - a union of form and function. Also, John cited several practical ideas that were used in various restaurants with high noise levels and reverberant walls and ceilings.

Dr. A. Lightstone, President - Valcoustics Canada Ltd.
Topic: "The Design of Live-End, Dead-End Studio Control Rooms"

Al gave us an explanation of what is commonly known as the "Haas Effect" with various sketches shown on the overhead projector. A detailed example was given of a studio where the operator is facing an audio monitor as well as video display. Half the room was covered with absorption materials, creating an anechoic area. The other half, behind the operator, being highly reflective. The blending of these two principles resulted in a perfect studio environment.

Sharon Abel thanked the speakers for their excellent presentations.

Donuts were provided, courtesy of Decoustics Ltd.

Attendance: 43

Next Meeting: Tuesday, 10 January 1983

Theme: Student Evening and Lab Tour

Location: Institute for Aerospace Research, University of Toronto

Convenors: G. Johnston, W. Richarz and M. Barman

INTER-NOISE 84, CALL FOR PAPERS

The Institute of Noise Control Engineering (INCE/USA) has issued the Announcement and Call for Papers for INTER-NOISE 84. INTER-NOISE 84, the 1984 International Conference on Noise Control Engineering, will be the thirteenth in a series of International Conferences on Noise Control Engineering which began in 1972 in Washington, DC. INTER-NOISE 84 will be held at the Hotel Ilikai in Honolulu, Hawaii on 3 - 5 December 1984. Deadline for receipt of abstracts is 15 March 1984.

Copies of the Announcement and Call for Papers are available from the INTER-NOISE 84 Conference Secretariat, P.O. Box 3469, Arlington Branch, Poughkeepsie, NY 12603, U.S.A.

PRICES OF INTER-NOISE PROCEEDINGS ARE REDUCED

All of the Proceedings of past conferences are still available, and a reduced price is now available for a limited time for nearly all volumes. The list prices of these volumes have been reduced by 25% - 35% until 30 June 1984. This is the last time that a complete set of INTER-NOISE Proceedings will be available.

A flyer which describes the volumes in the series and contains ordering information may be obtained from the Institute of Noise Control Engineering, P.O. Box 3206, Arlington Branch, Poughkeepsie, NY 12603, U.S.A.

NEW JOURNAL

The University of California Press is pleased to announce the appearance of a new international journal edited by Diana Deutsch with the assistance of a very distinguished board of associate and consulting editors.

MUSIC PERCEPTION publishes original empirical and theoretical papers, mothodological articles, and critical reviews from a broad range of disciplines, including psychology, psychophysics, linguistics, neurology, neurophysiology, artificial intelligence, computer technology, physical and architectural acoustics, and music theory. MUSIC PERCEPTION is intended to foster communication between the researchers and theorists interested in the study of the perception of music and thereby contribute to a unification of this rapidly growing field.

Contact: The University of California Press, Berkeley, CA 94720, U.S.A.

ASTM NEWS

A new Subcommittee on Open Plan Offices was formed during the meetings of American Society for Testing and Materials (ASTM) Committee E33 on Environmental Acoustics, 3 - 6 October 1983, in Philadelphia. The new Subcommittee will focus on open plan acoustics, an emphasis not provided by E33 in the past.

R.K. Herbert of Ostergaard Associates, an acoustical consulting firm, will chair the Subcommittee on Open Plan Offices. Herbert has extensive experience in the design and evaluation of open plan offices.

The new Subcommittee will take over jurisdiction of existing E33 Task Groups on Open Plan Ceilings, Office Screens, Background Sound Distribution, and Open Office Speech Privacy. Additional Task Groups will be formed as they are needed.

A new Task Group on Shipboard Noise Control was also formed at the E33 meetings. The new Task Group will develop a standard test method to determine the effect of noise control materials applied to the faces of aluminum ship bulkheads. The test method will be based on ASTM Standard Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

The Task Group on Sound Intensity Measurement Techniques seeks case studies where sound intensity techniques have been used to measure sound absorption, sound transmission loss, or other properties covered by current E33 standards. Information about such studies may be sent to the Task Group Chairman, M.A. Lang, Owens-Corning Fiberglas, P.O. Box 415, Granville, OH 43023, U.S.A.

The next E33 meeting will be in Jacksonville, Florida, 9 - 11 April 1984. Visitors are always welcome at E33 meetings. Further information about Committee E33 and its activities can be obtained from David R. Bradley, ASTM, 1916 Race Street, Philadelphia, PA 19103, U.S.A., telephone (215) 299-5504.

SUMMER PROGRAM IN ACOUSTICS

A four-week summer program in Underwater Acoustics and Signal Processing will be offered 4 - 29 June 1984 by the Pennsylvania State University's Applied Research Laboratory and Graduate Program in Acoustics.

Written inquiries should be directed to Dr. Alan D. Stuart, Summer Program Coordinator, c/o The Penn State Graduate Program in Acoustics, P.O. Box 30, State College, PA 16801, U.S.A.. Telephone inquiries may be made to Mrs. Barbara Crocken, Administrative Assistant, at (814) 865-6364.

NEW ADDRESS

Ken Simpson
Aeronautical Noise Analyst
Civil Aviation Planning, Pacific Region
Transport Canada
P.O. Box 220
800 Burrard Street
Vancouver, British Columbia
V6Z 2J8

The new office is in room 880, and the aviation noise complaint telephone number is now 666-5537.

NEW RESEARCH CONTRACTS

To Fathom Oceanology Limited, Mississauga, Ontario, $24,516, for "Army/navy shipboard underwater sound search, arrival depth sonar cable design modification - phase 1A." Awarded by the Department of Communications.

To J.F. Mattock, Edmonton, Alberta, $10,000, for "Preparation of detailed plans to complete the development and testing of the correlation sonar profiling current meter." Awarded by the Department of Fisheries and Oceans.

To Interactive Circuits & Systems Limited, Ottawa, Ontario, $147,000, for "Development of a sonar beamformer by a novel interpolation technique." Awarded by the Department of National Defence.

To D. Huston, Victoria, B.C., $1,500, for "Development and testing of a numerical model of the echometer." Awarded by the Department of Fisheries and Oceans.

To Jasco Research Limited, Victoria, B.C., $6,000, for "Analysis of sea surface conditions by long range sound propagation." Awarded by the Department of Fisheries and Oceans.

To Arctic Sciences Limited, Sidney, B.C., $459,993, for "Development of techniques for acoustic measurement of directional ocean wave spectra." Awarded by the Department of Fisheries and Oceans.

To EBA Engineering Consultants Limited, Edmonton, Alberta, $7,510, for "Preparation of a detailed report on the description and pricing of the acoustic telemetry system to monitor subsea thermistor cable." Awarded by the Department of Energy, Mines and Resources.

To Hoglund Engineering, Langley, B.C., $9,180, for "Noise and vibration measurements of the National Research Council 50 kW vertical axis wind turbine." Awarded by the National Research Council.

To Canadian Astronautics Limited, Ottawa, Ontario, $7,599, for "Synthetic aperture sonar study - phase III." Awarded by the Department of National Defence.

To JEM Resarch Institute Society, Victoria, B.C., $48,240, for "Investigation of a speaker verification system using parameters derived from the LPC-10 algorithm." Awarded by the Department of Communications.

To D. Huston, Sidney, B.C., $3,948, for "Development of theory and analysis of operation of an echometer for the remote detection of sound speed." Awarded by the Department of Fisheries and Oceans.

To Department of Physics, Queen's University, Kingston, Ontario, $90,344, for "Non contact ultrasonic inspection of aluminum strip." Awarded by the Ontario Board of Industrial Leadership and Development (BILD).

CALENDAR 1984

March 6-9
Oceanology International 84
Brighton, UK

March 7-13
European Congress on Ultrasonics in Medicine
Strasbourg, France

April 10-12
Institute of Acoustics Spring Conference
Swansea, UK

May 7-11
Acoustical Society of America
Norfolk, Virginia, U.S.A.
(Deadline for abstracts 20 January 1984)

July 25-28
Tenth International Symposium on Nonlinear Acoustics
Kobe, Japan

August 5-10
7th World Congress on Linguistics
Brussels, Belgium

August 21-24
Fourth FASE Congress
Sandefjord, Norway

Fall
CAA Annual Meeting
Quebec City, Quebec

October 8-12
Acoustical Society of America
Minneapolis, MN, U.S.A.

December 3-5
INTER-NOISE 84
Honolulu, Hawaii, U.S.A.
(Deadline for abstracts 15 March 1984)

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CAA ANNUAL GENERAL MEETING

Minutes

1. Welcome

The meeting was called to order at 4:15 p.m. on October 20, 1983, at the Hotel Georgia, Vancouver, B.C.

2. Minutes of 1982 Annual Meeting

These were published in Volume 11(1) of Canadian Acoustics and have therefore been circulated to the membership.

Motion: That the minutes of the 1982 meeting be accepted as read.

CARRIED

3. Treasurer's Report for 1982-1983 Year (see Appendix 1)

This was presented by Jean-Gabriel Migneron in the absence of the Treasurer. It appeared that the reference the "North American" subscriptions should have been "U.S." subscriptions. The question of whether the Edmonton organizing committee returned the $2000.00 float for the meeting in 1981 was raised. The President will look into this.

ACTION: C. Sherry

The question of professional audit was raised. It was explained that the membership had moved at the last Annual General Meeting that Bill Bradley conduct 1982-83 the audit.

Motion: That C.W. Bradley conduct the audit for CAA for 1983-1984.

CARRIED

4. Correspondence received by the Executive Secretary and President

The President announced that he had received a letter from the Secretary, John Manuel, containing his regrets at being unable to attend the meeting since his employer decided he must stay in his province. No objection was raised to D. Benwell as acting secretary for this meeting.

The President announced further correspondence received as follows: -

(i) Convenors Report CAA Toronto 1983. The report received from John Manuel stated that the meeting was the least well supported to date by CAA members but that the seminars were very successful.

(ii) Convenors Report Finances CAA Toronto 1982. This report received from John Manuel included the following information:

Noise Training Courses: March 1982, 44 candidates, $2442.93.

CAA Toronto Week October 1982, 72 people, $2900.00.

The latter account cannot be finalised due to a demand from the Hotel for $2000.00 as less than 75 rooms per day were occupied by CAA registrants, the hotel claiming a maximum of 16. The hotel has also refused a $1000 payment. The Directors will have to deal with this issue. The question was raised as to whether the above money had been submitted to the Treasurer. The answer was negative as far as was known in the absence of the Treasurer at the meeting. The President will look into this.

ACTION: C. Sherry

The President stated that he felt legal advice was needed regarding the hotel and will look into this. Support for the Directors to take any required action was expressed from the floor.

In the absence of the CAA secretary, no other correspondence was submitted or discussed.

5. Editor's Report

This was given by Dee Benwell, Editor-in-Chief. The main item was the announcement of the resignation of Dee Benwell, Editor-in-Chief, and Moustafa Osman, Editor, after their 5 years, association with the CAA publication. Thanks was expressed to all who had contributed to CANADIAN ACOUSTICS and support from all of the present staff was given to the nominated editor.

Motion: Thanks to the editors.

CARRIED BY APPLAUSE

6. Report From Directors on the Winner of the Directors' Award

Moustafa Osman announced the winner of the 1982 Directors' Award for the best paper published in the 1982 volume of CANADIAN ACOUSTICS by an author of 35 years or younger. The Award went to Dale D. Ellis, of the Defence Research Establishment Atlantic, for his paper entitled "Some Simple Formulae for Normal Mode Wave Numbers, Cutoff Frequencies, and the Number of Modes Trapped by a Sound Channel, Volume 10(4), pp.7-17. The Award, a Scroll, will be presented to Dr. Ellis at a later date by a Director of CAA, Les Russell.

ACTION: L. Russell

7. <u>Report on Meeting of Inter-Noise 83 International INCE</u>

The following report was given by David Quirt.

INTER-NOISE 83, the Twelfth International Conference on Noise Control Engineering, was held in Edinburgh, Scotland from 13 to 15 July 1983. The conference was sponsored by the International Institute of Noise Control Engineering (International INCE) and organized by the Institute of Acoustics of the United Kingdom.

The theme of the conference was "Noise Control: The International Scene" and it brought together contributions on all aspects of noise control, with emphasis on practical approaches to real problems. The conference was attended by 680 delegates from 38 countries.

A two-volume set of Proceedings of the conference has been published; this contains 297 summaries (in 4-page format) of the papers presented at the conference. Copies are available (at 48.00 per set) from:

Institute of Acoustics
25 Chambers Street
Edinburgh EH1 1HU
United Kingdom

The Ninth General Assembly of the International Institute of Noise Control Engineering was held on 15 July, following the conference. David Quirt represented the Canadian Acoustical Association at this meeting. The Institute now has 23 member societies (from 21 countries) and five sustaining members (the Netherlands, Rion, CEL, Bruel and Kjaer, and Norwegian Electronics).

It was confirmed that the next INTER-NOISE conference will be in Honolulu, 3 to 5 December 1984, and that the 1985 conference will be in Germany.

8. Report on Meeting of Ultrasonics International

Hugh Jones was not present to report on the above. Dee Benwell stated that the meeting was successful. However it was smaller than customary and poorly attended by North American experts.

9. Report of 12 ICA Planning Committee

This report, attached as Appendix 2, was given by Edgar Shaw.

10. Report of the Activities of the Directors and Executive

The president reported the following: -

(i) The CAA is now recognized as a charitable organization. As a result 2 forms must be completed and sent to Revenue Canada and a letter written to ask for special permission to accrue money for the 12th ICA meeting.

Motion: That the Secretary prepare and send a letter to the Ministry of Revenue to acquire permission to hold charitable funds for the 12th ICA meeting.

CARRIED

(ii) The membership were asked their opinion of the subject of a Membership Directory (as outlined in a letter from the President, Canadian Acoustics, 11(4), pp.14-15). After some discussion the following motion was made.

Motion: That the Directors and Executive publish a Directory of Members including an indication of the field of interest with a disclaimer on the part of the CAA that it does not endorse any claims made.

CARRIED

ACTION: C. Sherry

(iii) It was announced that the Directors and Executive had considered the idea of a Scholarship and had agreed that it should be at least $1000.00 and would not be awarded until 1986. At that time the age requirement on the Directors' Award might be dropped. Volunteers were requested to form an Ad Hoc Committee to look into a scholarship award. Those that have donated money to the scholarship fund are requested to send in their ideas and any others interested please contact the Secretary.

ACTION: Membership

(iv) It was announced that NRC Associate Committee on Machinery Noise had proposed to the CAA that a 300 page book on Noise Control, previously published by NIOSH, be printed and distributed in Canada. This would be a useful educational service and could raise funds for 12th ICA. The Directors and Executive are examining this proposal.

ACTION: C. Sherry

(v) Membership. There was a short discussion on improving membership.

Motion: That Annabelle Cohen be made chairman of the membership committee and an honorary director. Annabelle has the authority of CAA to choose her own committee.

CARRIED

(vi) It was announced that the structure of CAA will be reviewed. Comments or ideas from the CAA Members would be welcomed by the Directors.

ACTION: Membership

C. Sherry

11. <u>Consideration of the Location of the Next Annual Meeting</u>

A report of the 1983 Vancouver meeting was given first by Doug Whicker. This meeting had achieved its aim to attract people outside CAA for the seminars. Approximately 46-48 registered for the Electroacoustics Seminar, and 21 for the Machine Health Monitoring Seminar. There were 62 registrants to the CAA Symposium (NOTE: A total of 80 were reported by the close of the symposium - sec.). A financial statement should be submitted in two weeks time. It was expected that finances from the week would be close to breaking even (0 to $1000 deficit).

1984 Meeting. Jean Gabriel Migneron moved as follows: -

<u>Motion</u>: That the CAA hold its next meeting in Quebec City.

CARRIED

<u>Motion</u>: That the Directors and Executive solicit a grant from NRC.

CARRIED

1985 Meeting. A tentative suggestion was made that this meeting should be held in Ottawa, Ontario. Robin Halliwell was requested to take this suggestion to Ottawa and to bring back their decision.

1986 Meeting. There was some discussion on what should be done in 1986.

12. Consideration of the Fee Structure for 1984

Motion: Whereas the Directors and Executive feel that no benefit is gained from having a different fee schedule for members and organizations, be it resolved that the membership fee for 1984 be: -

$5.00	for Students
$15.00	for Members
$15.00	for Subscriptions for organizations.

CARRIED

13. Report of the Nominating Committee with Respect to the Executive

Tom Northwood, Past President, gave the following report (previously published in Canadian Acoustics 11(4), p.63:

The following nominations are made: -

President:	Cameron Sherry (continuing)
Executive Secretary:	Deirdre Benwell
Editor:	John Bradley
Treasurer:	Jean Nicholas (continuing)
Directors:	The terms of 2 of our directors, Bob Cyr and

John Hemingway, expire this year. To replace them, John Leggat (Defence Research Establishment Atlantic) and Peter Vermeulen (University of Calgary) are nominated to each serve for a 4 year period.

Motion: that the nominations be closed.

CARRIED

Four motions were then made and are summarised as follows: -

Motion: that the nominated candidates for the positions of Directors and Executive be accepted.

CARRIED

Thanks were expressed to the 2 retiring Directors, John Hemingway and Bob Cyr; to the retiring Editors, Dee Benwell and Moustafa Osman; and to the retiring Secretary, John Manuel.

16. Other Business

(i) H.G. Pollard presented a report (Eds. note see letter in this issue of Canadian Acoustics). This resulted in the following motion being made.

Motion: Therefore, be it resolved, that the membership of the Canadian Acoustical Association, authorize their executive to contact the Federal Building Code Authorities and Provincial Building Code Authorities to enquire whether the civic and municipal building inspection departments within their jurisdictions:

(1) Require field sound testing of the walls in completed multi-family housing structures, to ensure compliance with the sound requirements of the building code, prior to occupancy permits being granted, and, if not:

(2) to stress the reasons for and necessity of such tests being conducted in a random selection of a percentage of the units in every multi-family dwelling, prior to occupancy permits being granted and:

(3) That the results of such tests, be available to all prospective purchasers upon request.

CARRIED

(ii) Les Russell announced that the NRC Associate Committee on Machinery Noise was offering courses around the country. The second course is to be held at the University of Alberta shortly.

(iii) Bourne Unsworth announced that he was willing to show a movie by BC Transit on their ART system after the meeting.

(iv) Motion: Whereas it is recognized by many residential developers, multi-family dwelling occupants, government authorities and acoustical experts that the existing requirements of the National Building Code for minimum party wall and floor privacy are deficient.

It is moved that this organization go on record as recommending a apparent field installed party wall and floor sound transmission class rating of at least 50, that this resolution be conveyed to the appropriate building code authorities, and that the executive report to the membership on their progress with this resolution.

CARRIED

17. Adjournment

The meeting adjourned at 7:20 p.m.

APPENDIX 1

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS FOR PERIOD 1 SEPTEMBER 1982 TO 31 AUGUST 1983

ETAT DES REVENUE ET DEPENSES POUR LA PERIODE DU 1er SEPTEMBRE 1982 AU 31 AOUT 1983

Receipts - Revenus

Memberships, advertising, contributions Cotisation des membres, publicité, dons	$ 9 313.05
Meeting Edmonton 81-Congrès	526.58
12ième I.C.A.	1 580.00
Student memberships - membre étudiant	105.00
Subscription U.S.A. - Abonnement E.U.	455.00
(Sustaining subscription - Contributions de soutien) . $85	495.00
Scholarship prize - bourse pour étudiant	95.00
Intérêts	560.15
	$13 129.78

Disbursements - Dépenses

Printing of C.A. - Impression de l'A.C.	4 728.72
Postage - Poste	873.08
12e I.C.A.	1 580.00
CAA 1983 Committee Vancouver	1 000.00
Miscellaneous (tel. + bank charge + no fund cheque, award) Divers (tél. + frais bancaires + chèques sans fonds, prix)	367.27
	$ 8 549.07

Excess receipts over disbursements Excédant revenus versus dépenses	4 580.71

BALANCE SHEET - ETATS FINANCIERS

Assets - Actif

Cash on hand - Solde	$16 372.60

Liabilities - Passif

(Balance - Solde) 31-08-82	$11 791.89
(Excess - Surplus) 30-08-82 → 31-08-83	4 580.71
	$16 372.60

Audited by/Vérifié par: C.W. Bradley

APPENDIX 2

REPORT BY THE CHAIRMAN OF THE 12ICA EXECUTIVE COMMITTEE TO THE CANADIAN ACOUSTICAL ASSOCIATION FOR THE YEAR ENDING 19 OCTOBER 1983

The 12ICA Executive Committee came into being on 20 October 1982 when it was appointed by the CAA at the Annual General Meeting of the Association in Toronto. During its first year the Committee has concentrated its attention on various strategic issues and on the formation of a strong network of specialized Committees to plan the various Congress activities. The membership of these Committees is shown in Appendix A. The Executive Committee has met formally on three occasions (15 December 1982, 2 March 1983 and 15 September 1983) and has taken the following specific actions:

(a) Established orderly procedures for financial planning and administration, received tentative projections of receipts and expenditures for the period 1982-86 and approved budgets for 1982-83 and 1983-84;

(b) Considered preliminary plans for the Congress Technical Programme and prepared a provisional timetable for the distribution of circulars, the registration of Congress participants and the handling of manuscripts;

(c) Reviewed the facilities and accommodation available on the University of Toronto Campus for the Technical Programme, the Plenary Sessions, the Instrument Exhibition, the Registration area and for the accommodation of participants;

(d) Developed initial plans for Symposia in Halifax (Underwater and Imaging Acoustics), Montreal (Speech Communication) and Vancouver (Acoustics for Theatre Planning and the Performing Arts);

(e) Received valuable advice on a Logo for 12 ICA;

(f) Developed a plan to establish a Committee of Patrons;

(g) Met with the Commission on Acoustics (IUPAP) in Paris to present our plans for 12ICA and received their advice (Members of the Committee were also able to exchange ideas informally with Commission members at a reception held at the Canadian Embassy in Paris);

(h) Received valuable advice and information from members of the 11ICA Organizing Committee in Paris and reviewed the activities and arrangements at 11ICA in relation to our plans for 1986;

(i) Appointed Air Canada and Canadian Pacific Airlines as official carriers for the Congress (They will participate in the distribution of the first circular);

(j) Prepared a first circular in three languages for world-wide distribution (A press release for publication in scientific journals and magazines has also been prepared);

The Proceedings of 11ICA devoted four pages of text to each contributed paper compared with the single page format adopted in 1974, 1977 and 1980. This return to the practice of earlier years was the subject of much favourable comment in Paris and is likely to set the pattern for the Canadian meeting. The Technical Programme Committee for 12ICA is also giving much attention to the efficient use of meeting time and the production of a concise and easily-read printed programme to guide the participants through the complex array of parallel sessions that is a characteristic feature of these large meetings. The Programme Committee will soon be enlarged by the formation of a Committee of Subject Coordinators with one representative from each of the fourteen standard subject areas.

The fiscal year chosen by the 12ICA Executive Committee is identical with that of the CAA: It commences on 1 September of each year and ends on 31 August of the following year. The unaudited statement from Finance Committee Chairman Fred Hall for the fiscal year ending 31 August 1983 shows that the Executive Committee received \$100 from the CAA and \$1,480 from CAA members. During the year the only expense was a bank charge of \$3 leaving a balance of \$1,577 in Committee bank accounts on 31 August. The most recent projection (in current dollars) through 1986 shows estimated net expenses of approximately \$290K which is balanced by an estimated net income of approximately \$190K from registration fees and banquet tickets, \$50K from Exhibitors' fees and \$50K from donations and grants. This projection is based on the conservative assumption that there will be 1000 fee-paying participants.

Edgar A.G. Shaw
Chairman, 12ICA Executive Committee

Ottawa
18 October 1983

THE 12ICA ORGANIZATION

12ICA Executive Committee

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T.F.W. Embleton	Vice-Chairman and Chairman, Technical Programme Committee
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October 1983

LETTER H.G. Pollard

(Ed. Note: This letter was part of a presentation at the CAA business meeting in Vancouver, and was followed by a formal motion as described in the minutes of that meeting also published in this issue.)

1. My name is Gordon Pollard and I am the author of a letter addressed to your President, which, together with his reply, were reproduced in the July 1983, issue of CANADIAN ACOUSTICS.

2. I am also a Director of "THE CONDOMINIUM HOME OWNERS ASSOCIATION OF B.C.", a member of a Strata Corporation and have served as an executive officer of a Strata Council. Consequently, in these respects, I have held discussions with a multiplicity of strata lot owners in the lower mainland, Vancouver Island and in the northern, southern, eastern and western areas of the Province.

3. One common denominator surfacing during various discussions, has been the recurrence of complaints about noise between adjoining units in multi-family dwellings.

4. As of December 1981, 4,507 condominium projects, containing 77,533 strata lots, had been completed in B.C.

5. In 1978, THE B.C. REAL ESTATE ASSOCIATION published a 151-page book .... "CONDOMINIUMS - A DECADE OF EXPERIENCE IN B.C." The Editor was Dr. Stanley W. Hamilton, Associate Dean, Faculty of Commerce & Business Administration, University of British Columbia.

   On page 102, under the heading: "SPECIFIC CRITICISMS CONCERNING CONDOMINIUMS", it states in part:

   > "THE MOST IMPORTANT SPECIFIC CRITICISMS FOLLOW THE SAME PATTERN ESTABLISHED IN PREVIOUS STUDIES. LACK OF SOUNDPROOFING IS THE MOST COMMON COMPLAINT, FOLLOWED BY "PEOPLE PROBLEMS". POOR SOUNDPROOFING ACCOUNTED FOR 40.5% OF THE FIRST MENTIONED COMPLAINTS AND 22.1% OF THE TOTAL COMPLAINTS. ON THE BASIS OF STRUCTURE TYPE, THE COMPLAINT OF POOR SOUNDPROOFING WAS MOST IMPORTANT FOR APARTMENT RESIDENTS AS EXPECTED, GIVEN THEIR HIGHER DENSITY. THE REPETITION OF POOR SOUNDPROOFING AS THE SINGLE MOST FREQUENT COMPLAINT GIVES CAUSE TO QUESTION THE DESIGN OF THE PROJECTS."

6. On April 18, 1979, the "VICTORIA TIMES" and "THE DAILY COLONIST" featured news stories on their respective front pages, headed: "SOUNDPROOF SUIT LIKELY TEST CASE" and "CITY WOMAN WINS DAMAGES IN CONDO CASE".

   Both concerned a trial held in the SUPREME COURT OF B.C. (No. 1338 - Victoria), March 5 - 7, 1979 and involved a 55-unit condominium apartment in Victoria, where the PLAINTIFF had bought a suite for $49,500.00.

Subsequently, she complained that the transmission of sound through the walls, ceiling and floor from adjoining suites, made it almost intolerable as a dwelling. The DEFENDANTS were the developers and realtors that sold the unit.

The PLAINTIFF was awarded damages in tort and contractual damages of $7,500.00. THE REASONS FOR JUDGMENT OF THE HONOURABLE MR. JUSTICE LLOYD G. McKENZIE have not been appealed to my knowledge.

7. On August 30, 1980, my wife and I purchased a two-level strata lot in PHASE I of a recently completed 33-unit, brick and concrete condominium in LADNER, B.C. for $127,300.00 cash. This, after being assured by the developers, project managers and real estate agents, that the soundproofing was "EXCELLENT". Our occupancy occurred on October 20, which, coincidentally, is today's date.

   The "EXCELLENCE" of the soundproofing was strongly disputed by a majority of the resident owners, who, after the units adjoining theirs were occupied, immediately had recognizable and distinguishable noise problems.

   In July and August 1981, two Vancouver Acoustical Engineering firms were retained to conduct "SOUND TESTS" of various fully furnished strata lots in the development. One on behalf of the developers and the other, for the owners.

   An analysis of the acoustical data obtained by both and their accompanying reports, unequivocally indicated that the claimed "EXCELLENCE" of the soundproofing in the two-level units was grossly exaggerated.

   Furthermore, the DEVELOPER'S REPRESENTATIVE stated that the measured STC rating of a specific wall, was "LESS THAN THE BUILDING CODE MINIMUM REQUIREMENTS" and that the "privacy index measurements" made on the other walls, demonstrated they were also in the same range and likely deficient as well.

   However, prior to commencing legal action against the developers, they sold and transferred their vacant land holdings for PHASE II, to another developer and wound up their company.

   The new developer has no responsibilities for construction deficiencies in PHASE I. And .... as incredible as it may seem .... he has stated that PHASE II will be built as originally planned and designed .... using the same construction methods, materials, etc., approved by the Municipality and for which a Building Permit was issued a few years ago.

   DESPITE MY PROTESTATIONS, THE "PERMIT" IS STILL VALID!

8. It was, therefore, a combination of all the foregoing, that prompted me to launch a series of investigations, in an endeavour to: (i) determine the reasons why there were noise problems generally and specifically in

multi-family dwellings, ... (ii) why they were permitted to continue in new construction and .... (iii) who, or what, was responsible for the existing deplorable situation.

9. When Columbus began his epic voyage in 1492 .... he didn't know where he was going! When he got there, he didn't know where he was! And .... when he got back, he didn't know where he'd been! I now have a degree of kinship with Columbus.

10. In the National Building Code of Canada and its provincial and municipal counterparts, there is a Section, namely: "9.11" headed "SOUND CONTROL". However, because the NBC is essentially a set of minimum regulations respecting the safety of buildings with reference to: "PUBLIC HEALTH", "FIRE PROTECTION" and "STRUCTURAL SUFFICIENCY", senior provincial and municipal officials, have informed me that:

"NOISE IN MULTI-FAMILY DWELLINGS HAS NOTHING WHATSOEVER TO DO WITH PUBLIC HEALTH!"

Furthermore, that: "the inclusion of Section 9.11 in the Building Code was a MISTAKE and it should be DELETED".

Obviously, these officials had not studied a booklet .... "NOISE HAZARD & CONTROL", published by the "MINISTER OF NATIONAL HEALTH & WELFARE - CANADA" in 1979 .... and another booklet .... "NOISE - A HEALTH PROBLEM", published by the "OFFICE OF NOISE ABATEMENT & CONTROL, WASHINGTON, D.C." in 1978.

11. The "SOUND RATINGS" detailed in Section 9.11, are strictly "LABORATORY MEASUREMENTS OF AIR-BORNE SOUND TRANSMISSION LOSS OF BUILDING PARTITIONS".

12. The Engineers listed in the matrices of the 8 "STANDING COMMITTEES" of the ACNBC and their related specialty or background experience, are as follows:

"CHEMICAL"	"GEOTECHNICAL"
"CIVIL"	"MECHANICAL"
"ELECTRICAL"	"STRUCTURAL"

some of whom are required to be involved in, or have background experience in:

(a) "DESIGN AND/OR INSPECTION";

(b) "ILLUMINATION";

(c) "FIRE PROTECTION";

(d) "LIGHT CONSTRUCTION";

(e) "PLUMBING SYSTEMS' DESIGN".

There is no mention of: "ARCHITECTURAL ACOUSTICS", "CONSULTING ACOUSTICAL ENGINEERS", OR "ACOUSTICIANS"!

13. The only words and abbreviations that appear in the NBC, having reference to the foregoing, are "DECIBELS" and "HERTZ", listed in subsection 1.4.2.

14. IN CONCLUSION, IT SHOULD BE REALIZED, THAT WHILE THERE ARE NOISE PROBLEMS TO AN ALARMING DEGREE IN A MULTIPLICITY OF HOUSING PROJECTS IN CANADA, INDIVIDUALS WHO HAVE PURCHASED UNITS IN THOSE PROJECTS, ARE FREQUENTLY MUTED IN THEIR PROTESTS AND RELUCTANT TO TAKE LEGAL ACTION AGAINST THOSE RESPONSIBLE. THE REASON BEING, THAT IF THEIR COMPLAINTS BECOME WIDELY KNOWN IN THEIR RESPECTIVE COMMUNITIES, THE RESULTANT PUBLICITY WILL ADVERSELY IMPACT ON THE MARKET VALUE AND RE-SALE OF THEIR PROPERTY.

H.G. Pollard
#221, 4815 48th Avenue
Delta, British Columbia
V4K 1V2

LETTER R.A. Hewett

(Ed. Note: Mr. Hewett, Executive Officer, Associate Committee on the National Building Code was invited to reply to Mr. Pollard's letter.)

Dear Sir:

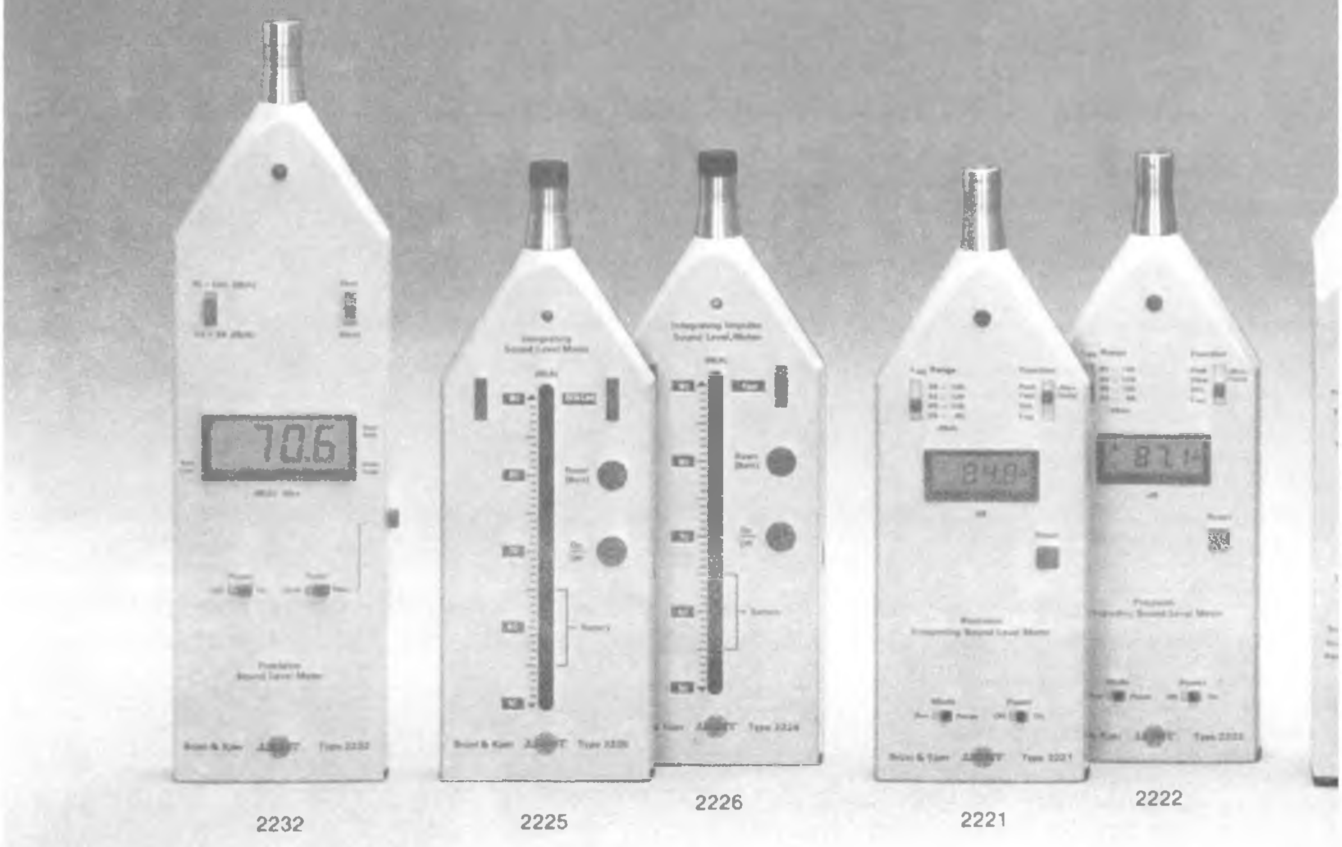
Thank you for the opportunity to respond to some of the comments made by Mr. Pollard regarding the sound control requirements in the National Building Code of Canada (NBC).

The NBC, in the minimum requirements spelled out in Article 9.11.2.1., requires that " ... every dwelling unit shall be separated from every other space in a building in which noise may be generated by construction providing a sound transmission class rating of at least 45 ...". Because this wording may be slightly ambiguous with respect to acoustical terminology, it should be made clear that it is intended that this minimum apply to the construction in place and not just to laboratory situations.

Having said that, it will be appreciated that the economics and logistics of enforcement by authorities having jurisdiction makes universal verification of conformance to this requirement a difficult and expensive proposition. For this reason, several examples of wall and floor/ceiling assemblies are provided in NBC Tables 9.11.2.A and 9.11.2.B which are "deemed to satisfy" the basic 45 STC rating. Laboratory testing has verified that the assemblies noted, when tested according to ASTM methods, will provide ratings as specified in the Tables. Assemblies designated as having a sound rating of I or II would thus be excused from further need to verify that the 45 STC minimum has been met.

Select your Instrument

Whatever your noise problem, B & K has the answer.



B & K Type no.		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Type of Noise	Continuous									—	
	Fluctuating, Erratic										
	Noise Events										
	Impulsive										
Frequency Response	Linear	—	—	—	Peak only	Peak only	•	•	•	—	•
	Weighted	A	A	A	A	A	A;C	A;C	A;C	A	A
	Filters	—	—	—	—	—	1624/1625	1624/1625	Int. Octave	—	—
Measurement Modes	RMS*	F,S	F,S	F,S,I	—	—	F,S,I	F,S,I	F,S	—	F,S,
	Peak	—	•	—	•	•	•	•	—	"P"warning	—
	Max. Hold	•	(Peak only)	•	F	S	• §	•	—	—	•
Averaging		—	60 s-L_{eq}	60 s-L_{eq}	L_{eq}, SEL	L_{eq}, SEL	L_{eq}, SEL	L_{eq}, SEL	—	Noise Dose	L_{eq}
Pause**		—	—	—	•	•	•	•	—	—	—
Dynamic Range dB		60	60	60	60	60	70	70	60	60	64
Outputs		DC	DC	DC	AC	AC	AC,DC	AC,DC	AC,DC	—	AC, LPinter
Complies with SLM standards	IEC Draft Integrating Type	—	2	2	1	1	1	1▲	—	—	0
	IEC 651/DIN Type	1	2***	2(Imp)	1	1	1(Imp)	1(Imp)	1	—	0(Im
	ANSI S1,4 Type	S1 A	S2 A	S2 A	S1 A	S1 A	S1	S1	S1	—	S1 /
Weight kg (lb)		0,46 (1,0)	0,37 (0,8)	0,37 (0,8)	0,4 (0,9)	0,4 (0,9)	0,85 (1,9)	0,85 (1,9)	1,1 (2,4)	0,25 (0,5)	3,5 (7

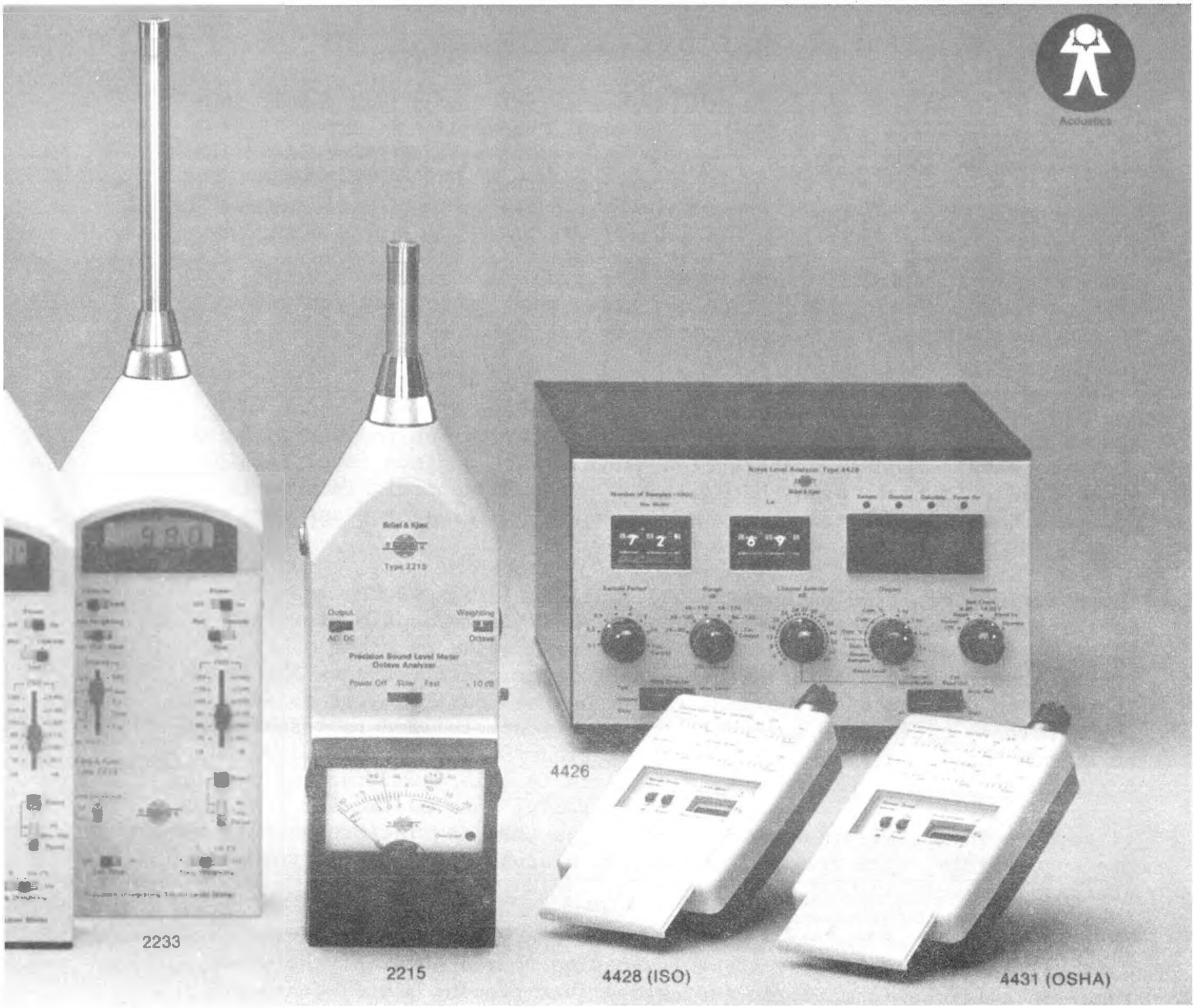
*) RMS time constant: Fast, "F"; Slow "S"; Impulse "I"

▲) Type 2233 fulfills DIN 45655 (TA-Lärm)

§) Plus Min. Hold

**) Used to exclude undesired events from L_{eq} or SEL measure

***)Except for RMS "Max. Hold"



Instrument selection

Before chosing your instrument, think about the characteristics of your noise problem. If you want to evaluate the annoyance of a noisy environment for a certain duration, L_{eq} may be required. For assessment of the risk of hearing damage, remember that the ability to measure impact noise ("Peak" or in some cases "Impulse" response) can often be useful. Measurement of a noise event, like vehicle pass-by, requires a "Max. Hold" function; and comparison of noise events can best be made using the SEL function, since the duration of the event may be as important as the maximum level. When considering whether to measure noise level or noise dose, think about the reasonably priced, powerful and versatile 2225/26 + 4428/31 combination. Statistical analysis can also be useful to complement noise-dose measurement in factories (See page 5). Finally, when choosing your instrument today, think about tomorrow's needs; most B & K products are equipped to handle your noise measurement problems for years to come.

Acoustical Calibrators

Acoustical calibration in the field ensures measurement accuracy and reliability, provides a reference signal for a recorder, and satisfies legal requirements.

Pistonphone Type 4220 produces 124 dB ± 0,15 dB at 250 Hz. Sound Source Type 4230 generates 94 dB ± 0,3 dB at 1000 Hz. The Dose Meters, the Sound Level Meters 2221, 2222, 2225, 2226, and 2232, and the statistical Analyzer 4426 require the Sound Source Type 4230 because the built-in A-weighting requires calibration at 1000 Hz. The Sound Level Meters 2215, 2230 and 2233 can be calibrated with either the 4220 or the 4230.


4220 Pistonphone
4230 Sound Source

Of course, inadequate workmanship and poor detail design can result in the intended minimum STC not being achieved, even with the assemblies provided in the Code. For this reason, an advisory Note is proposed for the Appendix of the 1985 NBC to draw the attention of the builder or inspector to these concerns. The Note will point out the differences between laboratory conditions and real-life assemblies that may include flanking paths, and will mention possible problems associated with wall-to-floor connections or that may arise when installing equipment or service facilities within acoustic separations.

The minimum value of STC 45 has sometimes been called into question. Certainly, many builders voluntarily exceed this minimum in order to reduce the possibility of complaints from occupants but the degree to which the Code should mandate construction above a bare minimum level remains unresolved. In fact, even the existence of sound control minimums in the Code has been questioned. There are, however, no present plans to remove them.

The Standing Committee on Housing and Small Buildings of the Associate Committee on the National Building Code, which is responsible for Part 9 of the NBC, is made up of individuals chosen to provide as broad a representation as possible in the area of light construction. Although there is no designated acoustical expert on the Committee, it is doubtful whether there would be a need for such highly specialized representation on an ongoing basis. The Noise and Vibrations Section of the Division of Building Research of NRC acts as a resource to this Committee and provides technical expertise as required. Additionally, when particular issues arise, the Committee can appoint task groups that may include members who are specialists, such as acousticians, to discuss the specific task assigned.

It is the desire of everyone involved with the process of preparing the National Building Code that it be responsive to the needs of the users. Whenever evidence is gathered indicating that present requirements are inadequate, mechanisms exist to bring the material to the attention of appropriate committees for consideration.

Yours sincerely,

R.A. Hewett
Executive Officer
Associate Committee on the
National Building Code
National Research Council
Ottawa, Canada, K1A 0R6

PROSPECTS FOR THE APPLICATION OF HIGH TECHNOLOGY TO HEARING AIDS*

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ABSTRACT

The rapid development of sophisticated consumer electronic products during the last decade has led to the expectation of a similar leap forward in the field of hearing aids. This paper discusses reasons why this has not occurred and indicates areas where one might reasonably expect to apply high technology to hearing aids in the future.

SOMMAIRE

Les progrès rapides enregistrés au cours des dix dernières années dans la mise au point d'appareils électroniques sophistiqués ont permis d'espérer les mêmes résultats dans le développement d'appareils de prothèse auditive. Cette communication explique pourquoi ces espoirs ne so sont pas concrétisés et discute des domaines dans le développement d'appareils de prothèse auditive plus perfectionnés où la haute technologie devrait normalement jouer un rôle dans les années à venir.

The advent of the digital wristwatch and the pocket computer has led to the inevitable comparison of the technical sophistication of the modern hearing aid with these popular electronic devices. The hearing aid is invariably the loser in such a comparison, and many people, both laymen and professionals, are asking why this should be the case. There are many reasons, not only technical, but financial, medical, psychological and sociological, as well. This paper will attempt to discuss some of these, to present an overview of recent attempts to improve the technical sophistication of hearing aids and to indicate areas where one might reasonably expect to apply high technology to hearing aids in the future.

THE TECHNOLOGY GAP

To an observer outside the hearing aid industry, the hearing aid of 1982 bears a striking resemblance to the hearing aid of 1972 or, in some cases, the hearing aid of 1962. This is not to say that there has not been progress. There has been a revolution in transducers, with electret microphones now used exclusively and receivers reaching new levels of miniaturization. Integrated circuits now are used in the vast majority of hearing aids, and many manufacturers are converting to thick or thin film hybrid circuits from printed circuit board construction. Still, the modern hearing aid remains little more than a miniature, personal PA system. To be sure, this PA system frequently has some form of frequency shaping and automatic gain

*Reprinted with permission from Hearing Instruments, January 1983.

control (AGC), but these features were found in the vacuum tube aids of the 1940's and 50's. Where are the microprocessors, the 64 K memories and the digital readouts? Why no built-in snooze alarm? In answer, one should first examine the needs.

THE AMPLIFICATION NEEDS OF THE HEARING IMPAIRED

In June of 1981 a conference was held at Vanderbilt University to address the problem of defining research needs in the area of amplification for the hearing handicapped. Prominent researchers from around the world were invited to present and discuss papers on selected topics. The proceedings of this conference, now published,[23] give no definitive indication of the amplification needs of the hearing impaired. There was, however, a general consensus that much more research needed to be conducted. This is a major reason for the lack of progress in the development of sophisticated hearing aids.

Research into hearing impairment is as old as the field of acoustics itself, yet, since World War II, little progress has been made. In fact, "thousands and thousands of hours of research in the behavioral field ... was misguided because of misunderstanding of the limitations of the physical measurements."[13] Because hearing aid research has been viewed as trivial and uninteresting by acousticians, much of the research burden has fallen to those lacking the multidisciplined training required to make such exacting work meaningful. As a consequence, hearing aid engineers, blessed with a technological smorgasbord, are constrained to a diet of bread and water by a lack of valid specification of the need.

The situation is further aggravated by a lack of meaningful criteria upon which to judge success or failure. For decades, speech discrimination has been sanctified as the ultimate measure of goodness for a hearing prosthesis. It is such a logical concept that it has been embraced by the research lab, clinic and hearing aid dispenser alike. And yet, things psychological are not always logical, and the speech discrimination test is no exception. In the first place, the test/retest reliability for tests of manageable duration is such that they are capable of differentiating only gross differences in amplification systems.[25] Secondly, different test materials have different sensitivity to various electroacoustic parameters.[11] Thirdly, substantial differences in measured intelligibility may be insignificant in the presence of contextual and non-verbal cues. Fourthly, there are other dimensions of equal or greater importance. Killion[12] has emphasised the importance of sound quality to the user. It often has been shown that, left to their own devices, individuals usually will not choose a hearing aid that optimizes their speech discrimination.[12] A hearing aid that is not used is of no benefit, regardless of the speech discrimination score. The same can be said for a hearing aid that is not purchased. The point is that speech intelligibility is only one measure of a multi-dimensional problem. It is the one that has received the most attention but, in fact, may not be the most important. It is essential to keep this in mind when evaluating potential technological improvements. The development of quantitative measurement methods for some of these other dimensions will be necessary if progress is to be made.

RECENT TECHNOLOGICAL SOPHISTICATION ATTEMPTS

Over the past decade, new technology has been incorporated into hearing aids in a variety of ways. A brief review of the results of this activity will give an indication of the current state of the art.

PHYSICAL PACKAGING

Miniature electret microphones have allowed smaller hearing aids to be built. This is due not only to their reduced dimensions but also results from their significantly lower vibrational sensitivity which permits mounting in closer proximity to the receiver. Smaller receivers, monolithic integrated circuits and hybrid construction techniques all have contributed to size reduction. In-the-ear (ITE) hearing aids with good performance characteristics have been made possible and have captured nearly 40% of the U.S. market in the past eight years. The canal aid, smaller than the ITE, just now is appearing and undoubtedly will find a market niche as well. These miniature aids show some technical merit such as shifting the primary resonant peak to around 2.7 kHz and by providing improved high frequency performance due to the elimination of tubing. However, their main appeal is cosmetic. Professionals too often give this dimension a low priority, but consumers do not. A hearing aid must be purchased and worn to be of benefit.

GREATER ADJUSTMENT FLEXIBILITY

Integrated circuits, hybrid technology and miniaturized components have permitted the design of very flexible hearing aids. Current aids can have as many as six adjustable controls. Both audiologists and hearing aid specialists asked repeatedly for more fitting flexibility.[17] However, according to a recent report, 60 to 80% of aids returned for repair have untouched fitter adjustments.[19] While these adjustments add to the cost of the aid, there really is no way to verify the benefits of the alterations they may provide.

SMOOTHER WIDEBAND RESPONSE

Thanks largely to the work of Carlson[4] and Killion,[12] hearing aids with smooth response out to 6 kHz are available and being applied. Several researchers have shown that low frequency amplification does not degrade intelligibility if it is combined with increased high frequency response.[1,20,21] The resulting sound quality is much more acceptable to the user than that produced by the "it has to hurt to be good" high frequency emphasis aid.

AUTOMATIC GAIN CONTROL

Considering the reduced dynamic range of the patient with a sensorineural hearing loss, the use of some form of automatic gain control (AGC) seems so logical that it ought to be viewed cautiously. There have been few studies on the benefits of long-term automatic volume control (AVC),[15,22] and the results seem to indicate that, although discrimination is improved for varying input levels, users generally do not prefer such systems.

Short-term AGC (compression) has been studied extensively with few clear conclusions.[26] It does appear to offer some benefits when tested with varying input levels, but long-term AVC may be more effective.

Despite this lack of consensus, AGC has been used in hearing aids for many years.[26] The use of integrated circuit and hybrid technology has resulted in more sophisticated AGC aids that permit the user to set the average output sound level with the manual volume control and have it automatically maintained. In addition, operating transients and distortion have been reduced.

AUTOMATIC HIGH PASS FILTERING

It has long been known that background noise has a predominance of energy below 1500 Hz, while the important speech cues lie above 1500 Hz. Manual low-cut filters have been incorporated into hearing aids for years. Integrated and hybrid circuits make it possible to produce wearable hearing aids in which the low frequency gain is automatically reduced by a steady state low frequency signal. This permits wideband operation for good sound quality, but narrow band operation when required for noise reduction.

APPLYING HIGH TECHNOLOGY

The confusion that has resulted from the last three decades of hearing aid research has restricted the number of areas where one might apply advanced technology. If the ear is viewed as a communications channel having some fixed limiting level and a sensorineural hearing loss is considered to, among other things, raise the noise floor, then the task of the hearing aid can be better appreciated.[5] It must compress the incoming sound into a dynamic range which lies between the upper limit and the elevated noise floor. The capacity of the channel has clearly been reduced. It would, therefore, be advantageous if unnecessary or competing signals could be removed to allow the remaining channel capacity to be best utilized. Most of the recent advanced laboratory systems are aimed at achieving one, or both, of these goals.

MULTIBAND COMPRESSION

Multiband compression has received much attention since Villchur's earlier work.[24] By dividing the spectrum into two or more bands, it is possible to provide separate compression parameters for each, thereby permitting close compensation for the reduced dynamic range of the hearing-impaired ear. Villchur reported considerable benefits for subjects with severe sensorineural loss, under conditions of varying input levels. Others have produced negative results for moderate losses under constant input conditions, and, in general, there is not a consensus as to the benefit of multiband compression.[26] Villchur's original system employed analog techniques, while those of other researchers were partially digital. Current technology is capable of producing one or two channel analog devices. Questions have been raised as to what can be gained from a digital approach. Uncertainty as to the aceptance of such devices has prevented commercial development. Additionally, the fitting of such systems will severely tax the current distribution system. Successful commercialization of multiband compression hearing aids awaits unequivocal proof of benefits and the development of fitting techniques and equipment compatible with the realities of the distribution system.

LOOK-AHEAD COMPRESSION

Lood-ahead compression is a relatively new concept, designed to provide instantaneous dynamic range limiting without introducing objectionable distortion or altering the fine temporal structure of speech. Such a system delays the signal by a few milliseconds and adjusts the gain at the instant of zero crossing so that the signal peaks all reach the same level. Hendrickson[10] has produced recordings of speech processed in this manner, and the sound is quite normal. His tests with hearing-impaired listeners show a significant advantage, but more work is required.

The output waveform produced by this system is not unlike that reported in earlier work by Gregory and Drysdale.[9] Their system modulated a high frequency carrier, clipped the single side band suppressed carrier signal, filtered out the distortion products and demodulated the result. Their test results for words and sentences for a range of subjects showed a significant improvement. This system is easier to implement with analog techniques, using existing technology, than the look-ahead system. The look-ahead system, on the other hand, could be implemented in integrated circuit form without major technical problems. If substantial benefits can be reliably demonstrated and the high frequency carrier clipping technique is not found to be equivalent, then this is a good candidate for the application of high technology.

ACOUSTIC FEEDBACK SUPPRESSION

Acoustic feedback is a very common complaint from hearing aid users. It is caused by leakage from a poorly sealed earmold combined with high acoustic gain in the hearing aid. Preves[9] constructed a number of circuits using adaptive notch and phase shifting techniques which allowed a gain increase of about 10 dB before the onset of feedback. He states that his circuits could fit into headworn hearing aids and operate from a 1.3 volt battery.

ADAPTIVE NOISE REDUCTION

There has been much interest in adaptive noise reduction in recent years. This interest originated with the military as a result of the move to low bit rate digital communications links. The environment in which these digital encoders must operate is very noisy and low data rate encoders are very sensitive to noise since the process of data reduction removes redundancies necessary for robustness. This is very similar to the case of sensorineural hearing loss, where data reduction occurs as a result of damage to the digital encoder (cochlea).

The adaptive noise filter is a digital or analog filter having a response that is controlled to be the inverse of the noise spectrum at any instant. These filters generally improve the quality of the speech but not the intelligibility; this is dependent on the noise spectrum and level. In the hearing aid field, the work of Graupe and Causey[7,8] appears promising, but few details have been published. Doblinger[6] has published early details of a portable system constructed with commerical signal processing of integrated circuits. The performance appears to be superior to other systems.

Bandwidth	300 to 3300 kHz
Noise reduction	32 dB
Limit (white noise)	-5 dB S/N
Limit (1/f noise)	0 dB S/N
Circuit	5 Intel 2920
Power supply	+/- 5 V @ 75 mA
Chip size (each)	5 x 6 mm
Estimated parts cost (US $)	$400.00

The possibility of producing this system in a headworn instrument, at a reasonable price, is not good. The Intel 2920 has been available for about three years, and the price is not likely to decrease. The application of newer processing technologies could certainly reduce the supply voltage and current to tolerable levels, but a five-fold reduction in size also is required. This is highly unlikely, and the cost of such an attempt would run in the millions of dollars. Further, such a device would be expensive to produce due to limited volume and low yield.

There are, however, analog techniques that can approximate the digital system using available components and technology. For example, a multiband compressor with long attack and release times will act as an adaptive filter, reducing the gain in those channels having steady signals present. The automatic high pass filter previously mentioned is a special case of such a system.

There are other ways in which these adaptive systems may be simplified for headworn applications. The number of filters could be reduced, or the filters could be analog types with only the controlling function implemented digitally. Such simplifications cannot be critically evaluated without some valid means of measuring their worth to the user. It is probable that such systems will improve intelligibility in some situations. It is also possible that they will make listening easier, although in a real environment the sound of constantly altering frequency response as people move about is a sound effects man's delight. However, at some point, the value of these features must be weighted against the cost, and for the foreseeable future, the cost is high.

FEATURE ENHANCEMENT

Feature enhancement involves the use of a computer to alter the speech signal to make it more intelligible. Ono[16] recently reported on a system developed in Japan, which enhances speech in inserting pauses, and altering phoneme duration and amplitude. Initial discrimination tests appear promising, and there are plans to produce a wearable unit. The computational requirements for such a system are not as great as for an adaptive noise filter, but a headworn unit is unlikely in the near future.

PROGRAMMABLE HEARING AIDS

In 1975, Blackledge[2] reported test results for a wearable, programmable hearing aid. This aid is programmed in conjunction with a special sound field master hearing aid by making screwdriver adjustments until an indicator light comes on. More recently, it has been proposed[14] to install a programmable read only memory (PROM) in a hearing aid and program it from a special audiometer. The PROM then controls the hearing aid characteristics via digital to analog converters and analog gates.

Technically, this system can be realized with existing technology. It possibly can be done using a semi-custom CMOS circuit at moderate expense. Power consumption will not be a problem, but producing an analog/digital CMOS IC to work at 1 volt may be.

In this case, the real questions are not of a technical nature. Does it make sense to replace trimmers that are rarely adjusted with a complex memory and control IC and the equipment needed to program it, when there is no clear evidence that the adjustments produce any benefit?

CONCLUSIONS

There is unlikely to be any rapid application of high technology to hearing aids for a number of reasons. Few genuine needs can be positively identified, and those that can, generally require very sophisticated, special purpose integrated circuits. The hearing aid market is not large enough to warrant the large expenditures necessary to produce such components. Neither the space, nor the required power source for these signal processing circuits, is likely to be available in a headworn hearing aid. And finally, it is unlikely that the consumer will pay the additional $500 to $1000 that such hearing aids almost certainly will cost unless the benefits are dramatic. After all, fewer than 20% of hearing aid users in North America wear two hearing aids and yet binaural fitting is the most cost effective signal processor currently available.

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L'EFFET DU VOLUME D'UNE SALLE SUR LA MESURE DES COEFFICIENTS D'ABSORPTION DU SON

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SOMMAIRE

Les mesures de coefficients d'absorption de 2 échantillons dans 4 salles réverbérantes équipées de façon semblable et d'un volume variant entre 16 m^3 et 250 m^3 montrent des différences significatives en basses fréquences. Il existe une relation presque linéaire entre le coefficient mesuré et le logarithme du volume de la salle. Cette relation pourrait expliquer en partie la variabilité des coefficients mesurés d'un laboratoire à l'autre.

SUMMARY

Measurements of sound absorption coefficients for 2 specimens in 4 similarly equipped reverberation rooms ranging in volume from 16 to 250 m^3 show significant differences at low frequencies. There is an approximately linear relation between the measured coefficient and the logarithm of the room volume. This could explain some of the differences in measured coefficients between laboratories.

INTRODUCTION

Malgré les normes déjà existantes pour la mesure du coefficient d'absorption du son dans une salle réverbérante (1,2), les problèmes concernant cette mesure sont encore très nombreux.

Il est cependant reconnu qu'une bonne diffusion du son dans les salles est indispensable à l'obtention de mesures valables. Par contre, plusieurs facteurs influent sur le degré de diffusion du son tel le nombre de diffuseurs, les caractéristiques des sources sonores, le volume de la salle, etc.

Afin d'approfondir la connaissance de ces facteurs, on a tenté d'isoler l'effet du volume d'une salle en rendant négligeables les effets des autres paramètres.

Ainsi a-t-on choisi la procédure expérimentale suivante :

- les mesures d'absorption ont été effectuées dans 4 salles réverbérantes dont le volume variait entre 16 et 250 m^3 ;

- chaque salle possédait des diffuseurs fixes et tournants dont l'aire totale correspondait à au moins 50% de la surface du plancher ;

- chaque salle était munie de 4 haut-parleurs alimentés séparément et de plusieurs microphones ;

- les décroissances recueillies dans chaque salle étaient très nombreuses et ont été analysées par ordinateur ;

- les mesures ont été effectuées pour 2 échantillons différents dans chaque salle.

Le présent rapport fournit les résultats des mesures effectuées au Conseil national de recherches Canada (CNRC) et examine les conclusions qui ressortent de l'analyse.

DESCRIPTION DES SALLES

Les 4 salles où les mesures ont été effectuées possèdent des murs parallèles. Le tableau 1 fournit les caractéristiques de ces salles.

La figure 1 montre les temps de réverbération de la salle sans absorbant A et le critère de Schroeder (1,2) comme fonction de la fréquence. Selon le critère de Schroeder, pour qu'un champs acoustique atteigne un champs diffus et qu'on puisse le

Tableau 1

Caractéristiques des salles

Salle	Volume $V(m^3)$	Aire du plancher $S_f(m^2)$	Aire des diffuseurs fixes (un côté) $S_d(m^2)$	Aire des diffuseurs tournants (un côté) $S_v(m^2)$	$(S_d+S_v)/S_f \times 100\%$	Fréquence de Schroeder F_s(Hz)
A	250,5	51,7	15,86	11,89	54%	315
B	121,8	34,3	17,84	1,67	57%	280
C	64,7	19,1	6,69	3,34	53%	315
D	16,2	6,7	4,95	1,28	93%	680

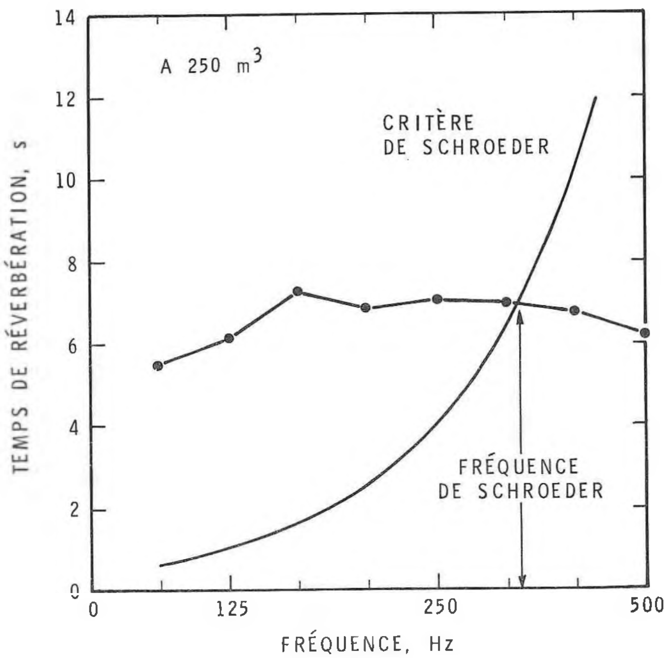

Figure 1 Temps de réverbération et critère de Schroeder pour la salle A

décrire adéquatement au moyen de statistiques, il faut que le temps de réverbération TR soit égal ou inférieur à T_s, où

$$T_s = \frac{V \cdot f^2}{4 \times 10^6} \qquad (1)$$

et V = volume de la salle (m^3)
f = fréquence (Hz)

Ce critère est illustré à la figure 1 où l'intersection des deux courbes donne la fréquence de Schroeder. Les fréquences de Schroeder de chaque salle se trouvent au tableau 1.

Malgré le critère de Schroeder, un volume de 85 m^3 serait suffisant pour les mesures de 125 Hz et plus, selon la norme ASTM C423. Par contre, dans la norme ISO 354 (2) un volume d'au moins 150 m^3 est exigé.

La salle D est un modèle à l'échelle de 1:2,5 de la salle A, avec rotation de 90° par rapport à l'axe horizontal. Le plancher de la salle A correspond donc à un mur de la salle D.

La salle A possède un contrôle d'humidité et de température et les salles A et B ont un système automatique de lecture de ces paramètres. La température et l'humidité dans les salles C et D furent mesurées au moyen d'un psychromètre et d'un thermomètre.

Les résultats des round-robins japonais (5) et australiens (6) indiquent qu'un nombre suffisamment élevé de diffuseurs assure un haut degré de diffusion du son pour les hautes fréquences. De plus, les diffuseurs tournants et les 4 haut-parleurs augmentent aussi la diffusion, comme l'ont indiqué des travaux effectués au CNRC (7,8,9). Enfin, l'utilisation d'un petit échantillon, d'environ 1 m^2 (voir section 3), garantissait presque le même degré de diffusion avant et après l'insertion de l'absorbant dans la salle, du moins dans les salles A, B et C.

DESCRIPTION DES ÉCHANTILLONS

Toutes les mesures ont été effectuées sur deux échantillons absorbants différents.

Les dimensions des échantillons étaient à l'échelle 1:2,5 de l'échantillon standard 2,44 m × 2,74 m. Ils mesuraient donc 0,98 m × 1,1 m, ce qui donne une aire de 1,07 m^2.

Le premier échantillon, (I), était composé d'un panneau de fibre de verre d'une épaisseur de 25 mm et recouvert de tissu. La surface supérieure de l'absorbant était maintenue à une hauteur de 160 mm au-dessus du sol grâce à un cadre de contreplaqué

13 mm, assurant ainsi une lame d'air de 135 mm entre le sol et l'absorbant (Montage E160 d'après la norme ASTM E795 (10)).

Le deuxième échantillon, (II), consistait en 100 mm de fibre de verre placée directement sur le sol et entourée d'un cadre de contreplaqué 13 mm d'épaisseur (Montage E160 d'après la norme ASTM E795 (10)).

Un ruban de caoutchouc assurait l'étanchéité entre le cadre et le sol.

À cause des effets d'aire très importants et de l'emploi d'échantillons si petits, on a mesuré des coefficients d'absorption assez élevés.

TECHNIQUES DE MESURE

Chaque salle était munie de 4 haut-parleurs alimentés simultanément par des sources autonomes de bruit aléatoire. Les courbes de décroissance étaient recueillies par un analyseur en temps réel relié à un mini-ordinateur. Les signaux reçus étaient séparés en bandes de 1/3 d'octave de 100 Hz à 10 kHz.

Le tableau 2 indique le nombre de microphones, le nombre de positions de l'échantillon et le nombre total de décroissances analysées par échantillon, dans chaque salle. Les décroissances obtenues à un microphone, habituellement 25, étaient additionnées de façon à obtenir une courbe plus régulière et une pente a été calculée.

L'ordinateur calculait alors les pentes des droites sur environ 20 dB par la méthode des moindres carrés et en déduisait les temps de réverbération.

Tous les microphones et les échantillons étaient placés dans les salles conformément à la norme ASTM C423 (3), sauf dans quelques cas peu importants où il était impossible de le faire.

Tableau 2

Details des mesures dans chaque salle

Salle	Nombre de microphones	Nombre de décroissances par microphone	Nombre de positions de l'échantillon	Nombre total de décroissances analysées
A	9	25	8	1800
B	9	25	4	900
C	9	25	4	900
D	8	20	2	320

Toutes les mesures pour un échantillon donné ont été effectuées la même journée dans chaque salle. De plus, on a mesuré la température et l'humidité de chaque salle sans absorbant et avec absorbant dans différentes positions. On a fait au besoin, des corrections pour tout changement, selon la norme ANSI S1.26 (11).

RÉSULTATS ET DISCUSSION

Les figures 2 et 3 donnent les résultats de mesures effectuées sur chaque échantillon dans les 4 salles.

À première vue, l'analyse se divise en 2 parties. Pour les fréquences supérieures à la fréquence de Schroeder dans la salle D, les résultats pour les 4 salles indiquent une concordance raisonnable si l'on tient compte de la marge d'erreur.

Pourtant, d'après les résultats au-dessous de 800 Hz, les coefficients d'absorption mesurés dans la salle D sont tout à fait différents de ceux mesurés dans les autres salles et ne sont donc pas valables.

Puisque la salle D est un modèle à l'échelle 1:2,5 de la salle A, on s'attendrait à ce que les effets remarqués dans la salle D à une fréquence donnée se produisent dans la salle A à une fréquence 2,5 fois plus petite. Ainsi doit-on conclure que pour les mesures inférieures à 315 Hz, effectuées selon les normes à l'échelle normale, la salle A sera en défaut par rapport aux salles plus grandes.

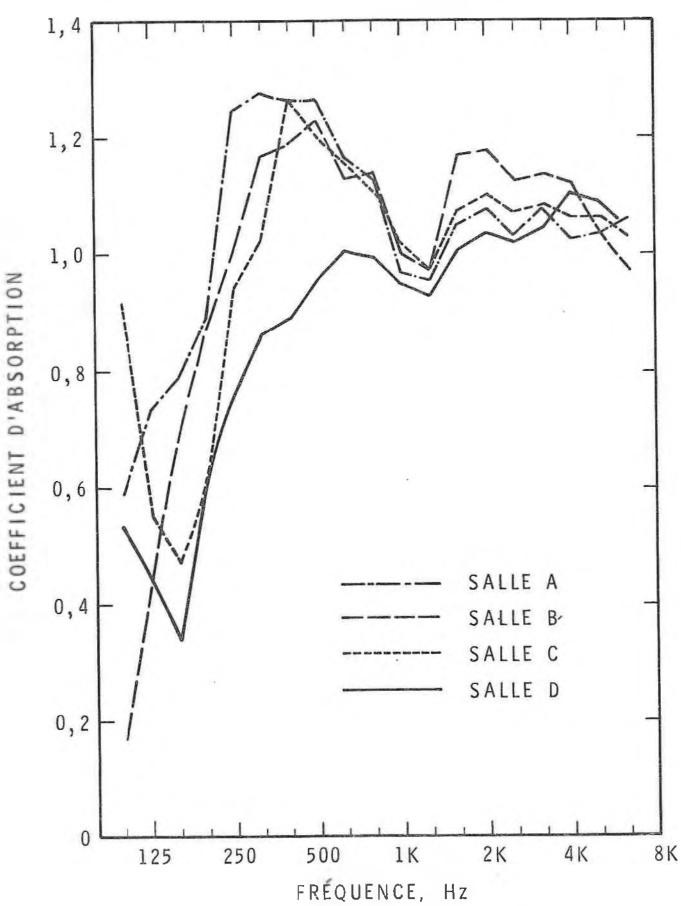

Figure 2 Coefficient d'absorption du son de l'échantillon I dans les différentes salles

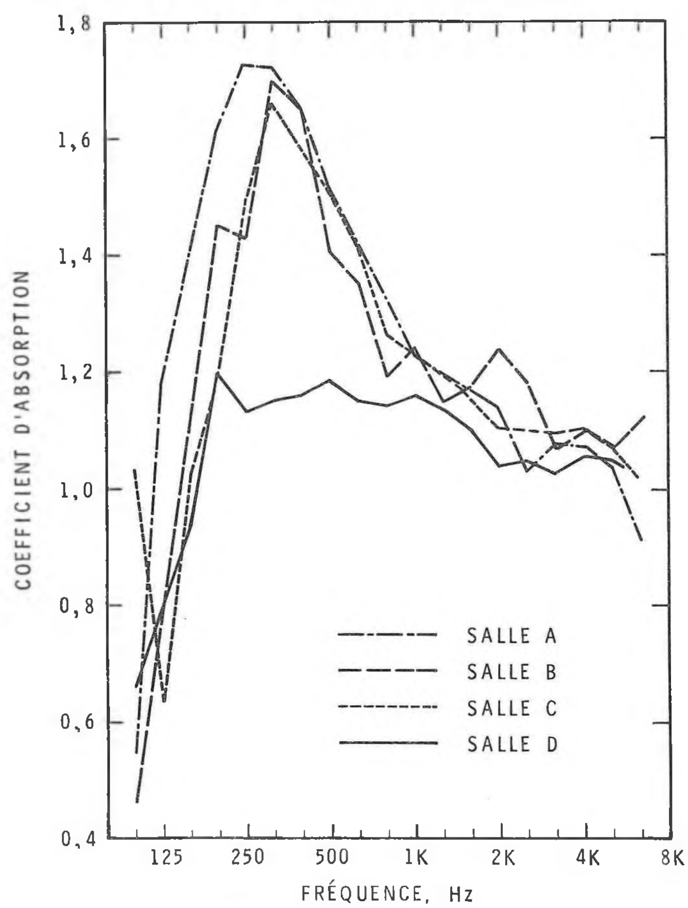

Figure 3 Coefficient d'absorption du son de l'échantillon II dans les différentes salles

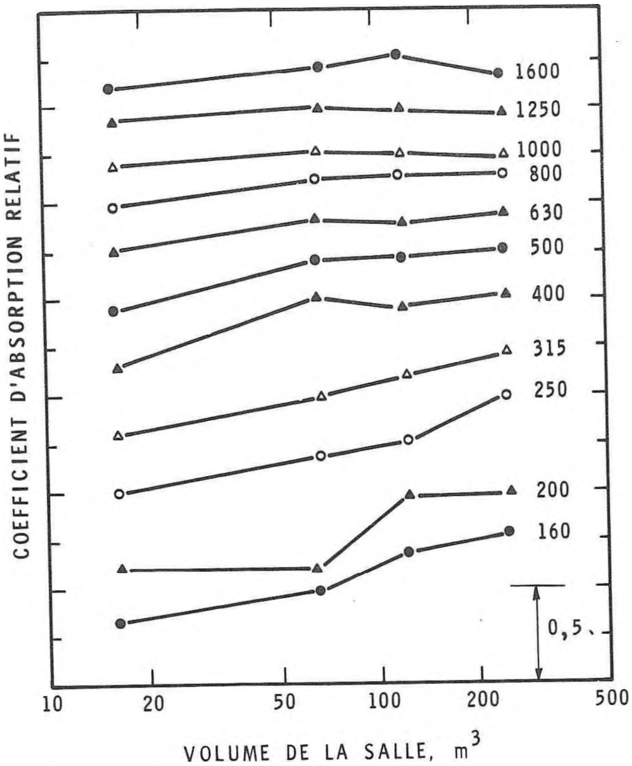

Figure 4 Coefficient d'absorption du son dans les 4 salles, échantillon I

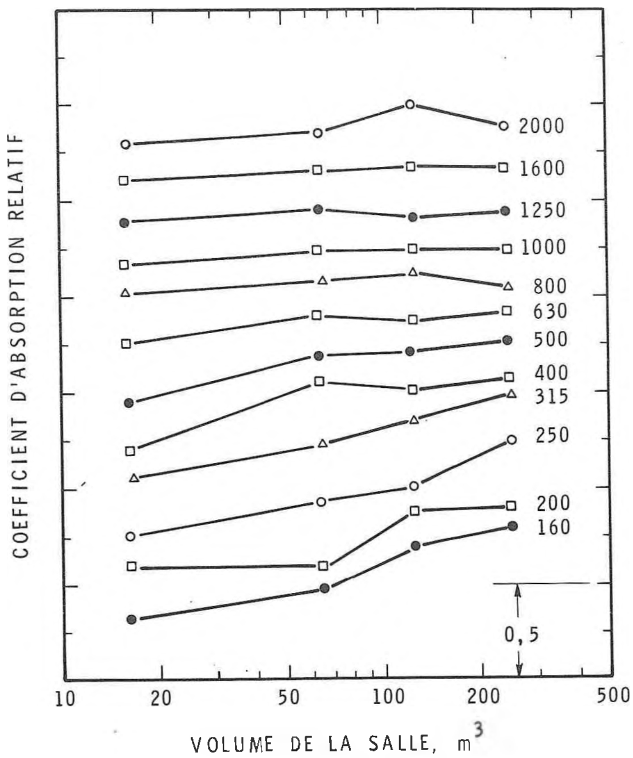

Figure 5 Coefficient d'absorption du son dans les 4 salles, échantillon II

Les figures 4 et 5 montrent les coefficients d'absorption en fonction du volume de la salle. Les courbes indiquent encore une fois, qu'au-dessus de la fréquence de Schroeder, il y a un bon accord entre les 4 salles. Mais au-dessous de cette fréquence, il y a une relation presque linéaire entre les coefficients et le logarithme du volume.

D'après la norme ASTM C423, qui utilise l'équation de Sabine, il est possible de mesurer les mêmes coefficients dans n'importe quelle salle réverbérante si le volume est supérieur à 85 m^3, ce qui est censé assurer un champ acoustique assez diffus. Cependant, les résultats de notre étude n'indiquent pas les mêmes conclusions. Puisque les volumes des salles réverbérantes typiques sont compris entre 200 m^3 et 400 m^3, l'effet du volume, quoique petit, existe néanmoins et pourrait expliquer en partie les écarts constatés entre les laboratoires dans les round-robins.

Cet effet, qui semble contredire la théorie simple de Sabine, requiert évidemment une explication. Toutefois, à l'étape actuelle des recherches, on ne peut que spéculer. L'effet semble cependant logique si l'on considère qu'un échantillon, petit par rapport à la longueur d'une onde, possède des coefficients d'absorption plus élevés que ceux d'un échantillon plus grand. Cet agrandissement est causé par la diffraction des ondes. Pourtant, lorsque plusieurs échantillons de petites dimensions sont rangés les uns à côté des autres, l'agrandissement est beaucoup moindre. Si l'on examine brièvement les images acoustiques d'un échantillon constitué par les parois, on constate un rapprochement de ces images lorsque le volume de la salle est réduit. Autrement dit, lorsque l'aire de l'échantillon s'approche de celle du plancher, le champs acoustique est fortement perturbé et la théorie simple n'est alors plus valable.

Il serait intéressant de voir si les résultats des expériences sembables effectuées dans plusieurs laboratoires permettent de constater le même effet. Cette tâche reste cependant à accomplir. En outre, les effets de plusieurs facteurs, y compris la grandeur et la vitesse de rotation des diffuseurs tournants et l'effet d'absorption ajouté à la salle "vide" (c.-à-d. sans échantillon) demeurent encore inconnus. En dépit des normes existantes, il reste encore beaucoup à faire pour trouver des méthodes permettant de mesurer correctement les coefficients d'absorption dans une salle réverbérante.

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Abstract

The revision of ISO 1999 (1975) "Assessment of occupational noise exposure for hearing conservation purposes" is described. The revised document ISO/DIS 1999 (1982) provides criteria that are as accurate and as practically useful as possible. The various features of this standard and its limitations are discussed. A new standard presently being drafted by the working group, "Guidelines for the measurement and assessment of exposure to noise in the working environment", is also described and related to current Canadian work on a C.S.A. standard for noise exposure measurement.

Sommaire

La révision de la norme ISO 1999 (1975) "Estimation de l'exposition au bruit durant le travail en vue de la protection de l'audition" est présentée. Le document révisé ISO/DIS 1999 (1982) fournit des critères qui sont aussi exacts et utiles que possible. Les diverses caractéristiques de cette norme et ses limites y sont étudiées. Une nouvelle norme actuellement rédigée part le groupe de travail, "Lignes directrices pour la mesure et l'évaluation de l'exposition au bruit dans le milieu de travail", est également présentée et mise en rapport avec les travaux canadiens actuels sur la norme de l'ACNOR pour la mesure de l'exposition au bruit.

1.0 INTRODUCTION

The activities of WG19 "Occupational Noise" are described from its inception to date in order to demonstrate the way in which ISO standards are formed and also to follow the development of an international occupational noise standard of importance to Canada. The background and progress of the revisions to ISO 1999 (1975)(1) and the present document (which should shortly go to press), are described. A description of the background, progress and contents of a new standard on guidelines for the measurement and assessment of exposure to noise in the working environment is given and is related to current Canadian activities.

2.0 REVISION OF ISO 1999 (1975)

2.1 Background

International Standards Organization (ISO) Technical Committee (TC) 43 Sub Committee (SC) 1 decided to set up Study Group D in 1976 in Gaithersburg, U.S.A.

This Study Group had the task of considering a possible revision to ISO 1999 and preparing an outline for this. The study group met for 2 days in 1977 and concluded that the new research data which became available in several countries during the latter stages of ISO 1999 development and after its adoption, as well as new instrumentation, made a revision of ISO 1999 highly desirable if not mandatory[(2)]. The study group went on to state that in the light of more recent data the 1975 standard tended to over estimate the risk of hearing impairment and that this should be corrected. In addition the definition of normal reference population serving as a basis for the standard should be more carefully defined. Finally the study group stated a preference for the revised standard to predict hearing impairment only, and to leave the definition of risk and handicapped disability to the individual countries or common language groups. The study group reported these findings to ISO/TC43/SC1 at their Vienna meeting in 1977 resulting in a resolution passed by the committee: to set up a Working Group 19 "Assessment of occupational noise hazard".

2.2 Progress of Document

The first meeting of Working Group 19 was held in 1978 with the author representing Canada. The scope of the working group was: "the formulation of methods for the assessment of occupational noise exposure for hearing conservation purposes". A number of background documents were considered at this time[(1-8)] including 3 reports from the National Physical Laboratory in the U.K., a report from the Netherlands TNO institute, and a report by Dr. D.L. Johnson (U.S.A.) which was published in 1978[(8)]. An outline for the revised document was prepared and tasks were assigned to various working group members, the author preparing the first draft of Clause 6: "Methods of Hazard Assessment".

From these documents a first draft for a revision of ISO 1999 was prepared in August 1979 and discussed at the second working group 19 meeting. The specific approach to the data incorporated (in graphical form), was based on Dr. Johnson's work[(8)], with the collaboration of Drs.' Passchier - Vermeer and Robinson. Following discussions and changes made at the working group meeting the First Draft Proposal ISO/DP1999/1 for "Acoustics - Assessment of Occupational Noise Exposure with Respect to Hearing Impairment"[(9)] was circulated for comment to member bodies of ISO. These comments were discussed at the next working group meeting in July 1980, and incorporated into the text where possible. One of the main decisions to emerge at this stage was the decision to tabulate information using equations and tables instead of graphs.

The next document to be circulated to members of ISO for comment was the layout for ISO/DIS 1999 "Acoustics-Determination of occupational noise exposure and estimation of noise-induced hearing impairment." Following incorporation of member country comments to this, the official draft international standard "ISO/DIS 1999 "Acoustics-Determination of Occupational Noise Exposure and Estimation of Noise-Induced Hearing Impairment"[10], was circulated for vote in April 1982. At this point extensive Canadian comments were offered. These comments primarily reflected the timeliness of simplifying the complicated issue of noise exposure quantities, a subject of controversy and debate for some time. The comments offered a new definition of noise exposure as the time integrated A-weighted squared sound pressure, E_{AT}, in pascal squared seconds x 10^3. This left decibels to unambiguously describe the equivalent A-weighted sound pressure level.

The international voting on ISO/DIS 1999 resulted in 20 countries in favour of the document, 7 countries opposed, with 2 abstentions. Very few of the reasons for disapproval did, however, contest the basic data and procedures of DIS 1999 and it was decided to proceed with publication of the standard. An editorial meeting was held in June 1983 to discuss the extensive comments on the document and a revised draft was produced incorporating most of these comments, including those from Canada. This document was presented to the full Working Group in July 1983, for their discussion and comments and was accepted for submission for publication as amended. The discussion at the plenary session of TC43/SC1, however, resulted in the inclusion of a note referencing the definition of L_{EX}, a term used in DIS 1999 that had since been incorporated into an EEC document.

It is hoped at this stage that the final revised standard ISO 1999 might be published in 1984.

2.3 Description of Revised Document

The revised version of ISO 1999 (198x) is well described by Henning von Gierke in reference 14. He states that it "allows the estimation of the noise-induced permanent threshold shift at all frequencies of interest in populations exposed to daily A-weighted noise exposure levels (L_{Aeq}) from 75 to 100 dB, and exposure durations from 0 to 40 years. Hearing impairment, risks and handicap can then be calculated according to each country's preference and maximum permissible noise exposures, settled upon by administrative decisions based on ethical, economic and political factors".

"An important feature of the approach is that it applies to noise with steady, intermittent, fluctuating, irregular or impulsive character. The latter feature is of particular interest - all impulsive noise is automatically included in the daily noise exposure level as long as the instantaneous sound pressure does not exceed 200 Pa (140 dB re μ 20 Pa). The implications of this recommendation for measuring and monitoring daily occupational noise exposure are obvious. It covers practically the whole range of industrial noise exposures and allows for easy integration of different exposure types and durations"[14].

The revised version of ISO 1999 (198x) contains sections on the description and measurement of exposure to sound, and on the prediction of the effects of noise on hearing threshold. The latter section allows the choice of 2 data bases, the one given in the document based on otologically normal persons (relating to ISO 7029), the other being a set of data collected on a control population not occupationally exposed to noise of the country under consideration (A separate data base for men and women is required unless it can be shown that there are no substantial sex differences). In addition there is a final section on assessment of noise-induced hearing impairment and handicap which outlines the methods by which this might be calculated. Finally an appendix of the document gives an example of the assessment of risk of noise-induced hearing impairment.

3.0 OCCUPATIONAL NOISE EXPOSURE MEASUREMENT DOCUMENT

3.1 Background

ISO/TC43/SC1 resolved at their meeting in 1980 to support a new work item dealing with the description and measurement of noise in the working environment. This decision was supported by the member countries and the task was assigned to WG 19.

3.2 Progress and Description of Document

The new work item was first discussed at the Working Group 19 meeting in Ottawa in 1982, at which time the background documents such as German[11], Canadian[12], and related ISO Standards were considered and a proposed title and list of contents for the new standard were drawn up. This was considered in more detail at the next meeting at which time section 4 was allocated to the German member, and section 5 was allocated to the Canadian member and the introduction, scope and field of application were allocated to the convenor, to draft. These draft documents were discussed at the last working group meeting and the next step is for the convenor to prepare the first draft proposal of the new standard for discussion at the next working group meeting, probably sometime in 1984.

3.3 Current Canadian Activities

The CSA Committee Z107 on Acoustics and Noise Control has a working group on occupational noise exposure measurement. In addition a Working Group on Occupational Noise Exposure and Hearing Conservation (of the Federal/Provincial Advisory Committee on Environmental and Occupational Health), was formed in 1982 with the task of preparing guidelines for occupational noise regulations. This latter group hopes to encourage uniformity of Canadian noise regulations which presently differ considerably from province to province[13]. It is hoped that Canadian and/or international standards on noise exposure measurement will soon be published to support the Federal/Provincial Working Group.

4.0 SUMMARY AND OBSERVATIONS

The revised ISO 1999 (198x) "Acoustics - Determination of occupational noise exposure and estimation of noise-induced hearing impairment", provides a reasonable basis upon which to develop Canadian occupational noise hazard assessment and consequent regulations. It is hoped that the international standards presently being drafted on occupational noise exposure measurements will also be useful and that Canadian occupational noise regulations will, through guidelines developed by the Federal/Provincial Working Group on Occupational Noise Exposure and Hearing Conservation, eventually be consistent across Canada. In this way "Standardization", national and international, may perform a very real and useful function in providing uniformity that is also relatively simple, practical, accurate and enforceable. This, coupled with a good hearing conservation program would provide practical protecton against noise-induced hearing loss.

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