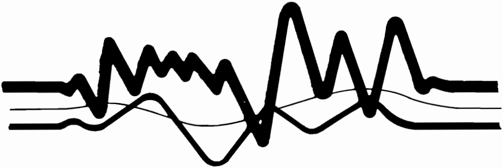
The Bulletin

OF THE AUSTRALIAN ACOUSTICAL SOCIETY

Volume 7, Number 3, December 1979



Addresses for Correspondence

Correspondence to the Society on National matters should be addressed to:

The General Secretary, Australian Acoustical Society, Science Centre, 35 Clarence Street, Sydney, N.S.W., 2000.

Correspondence to the Society on regional matters should be addressed to the appropriate Division Secretary as set out below:

N.S.W. Division (includes Queensland & A.C.T.): Mr. G. Patterson, C/ Science Centre, 35-43 Clarence Street, Sydney, 2000.
S.A. Division (includes N.T.): Mr. D.H. Woolford, 38 Lockwood Road, Erindale, 5066.
Vic. Division (includes Tasmania): Mr. W.J. Kirkhope, P.O. Box 130, Kew, 3101.
W.A. Division: Dr. I.H. Bailey, Department of Physics, W.A.I.T., Hayman Road, Bentley, 6102.

Address for Correspondence to The Bulletin

Mr. R.J. Law, c/o 240 Victoria Parade, East Melbourne, Victoria, 3002.

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THE BULLETIN OF THE AUSTRALIAN ACOUSTICAL SOCIETY

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- The Bulletin is published by the Australian Acoustical Society, Science House, 157 Gloucester St., Sydney, NSW, 2000.

GUEST EDITORIAL

Every great undertaking springs from a small beginning. At the outset it is weak and fragile and susceptible to criticism from every well-meaning, ill-informed bystander that cares to comment. Often, despite the best efforts of a small band of zealots, it grows awkwardly and takes on attributes that confirm the worst predictions of its most ardent critic. Then, when even some of the zealots are having second thoughts, quite suddenly, it matures and loses the awkwardness of inexperience. Major faults are seen to be growing pains, lessons are learnt, supporters are found and criticism subsides. Well wishers and band-waggoners then join the growing throng of persons that want to be associated with it; the venture is launched.

When viewed from south of the Murray, preparations for the 10th ICA have shown all the early signs of a great undertaking. At the outset there were more critics than zealots, particularly on this side of the river. Now, when the die is cast, it is evident that attitudes are changing. People throughout the Society are planning their work programmes to compliment the 10th ICA. Supporters are gathering behind the small band of zealots in NSW who had the vision to commit us to such a challenging venture. Success is by no means assured; 1980 is a time of reckoning for the Society. It is a time for every member, new or old, to help make the 10th ICA and the Satellite Symposia a triumph for Acoustics in Australia. Above all it is a time for good will and generous deeds.

I am sure every Society member joins me in wishing our NSW, SA and WA zealots every good fortune and good luck with their ventures for 1980. I am also sure every zealot in the Society wants you and me to stop talking and lend a hand.

D.C. Gibson
CSIRO, Melbourne

EDITORIAL CHANGES

I am confident that the pattern achieved this year in producing The Bulletin on schedule will be maintained when the new Editor, Mr. Rob Law of the Environment Protection Authority takes over on the 1st January 1980. My confidence is both in Rob Law as Editor and in The Bulletin Committee which has most ably assisted me during the past 12 months. It has been a pleasure to work with a group of people who simply get on with the job.

My hope for 1980 is that The Bulletin will improve in quality, and in frequency of publication -currently 0.000000095 Hz! The Bulletin provides an easy opportunity for each Division to be informed and to inform other Divisions of their programs. Advertisers view The Bulletin as worthwhile and I hope that Society members do too. Contributions, particularly spontaneous ones, are always very welcome.

Robin Alfredson
Editor

Rob Law
Editor 1980

SUSTAINING MEMBERS

The Society values greatly the support given by the Sustaining Members listed below and invites enquiries regarding Sustaining Membership from other individuals or corporations who are interested in the welfare of the Society. Any person or corporation contributing $200.00 or more annually may be elected a Sustaining Member of the Society. Enquiries regarding membership may be made to The Secretary, Australian Acoustical Society, Science House, 35-43 Clarence Street, Sydney, N.S.W., 2000.

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NEWS & NOTES

ANNUAL CONFERENCE AND DINNER 1979

More than sixty members and friends attended the dinner following the Society's Annual General Meeting. Held at the Park Royal Motel, in Parkville, Melbourne, on Friday 21st September, it was enjoyed by all.

Early next morning, with no evident after effects on speakers or listeners, the Annual Conference commenced. GERALD RILEY, in his last official function as President opened the proceedings. The theme of the one-day meeting was "Building Acoustics Design Criteria". Papers were presented by eight invited speakers on topics covering human criteria, traffic noise, aircraft noise, building partitions, reverberation, selection of materials and structure-borne noise.

Of the sixty-five participants, twenty were from interstate. It was particularly pleasing to see MARIE McCUDDEN and TIBOR VASS from Western Australia, and to welcome BRUCE MANSER from Queensland as well as our friends from NSW and South Australia.

Despite the impending 10th ICA, most of Australia's acoustical problems for the 80's were sorted out at lunch. Several of our articulate members are recorded here in action.

ANITA LAWRENCE summarised the achievements of the meeting, and at the close all present were grateful to KEN COOK (Convenor), REG McLEOD and LOUIS FOUVY for organising both functions.

A limited number of copies of the Proceedings are available for sale at $12.00 per copy. Orders should be sent to the Secretary, Victoria Division.

"DO YOU REMEMBER ....?"

"IT'S A WEAKER BREW DOWN HERE...."

"IT'S BETTER WITH MUSIC...."

TREASURERS REPORT

Audit reports for all Divisions for the year ending 31 March 1979 and for Council and the I.C.A. Account for the year ending 30 June 1979 have been obtained.

These show that after provision of funds for Councils activities and for the ICA each Division operated at a surplus as follows:

N.S.W.	$1,419.00
Victoria	822.14
South Australia	50.27
Western Australia	403.34

Council operated at a deficit of $178.72

Unfortunately, because of the different financial years applying to the Divisions and Council the audit statements cannot be used to provide consolidated income and expenditure for the Society as a whole or to provide a full picture of the financial position of the Society.

The income and expenditure for the whole Society including the Councils account has therefore been calculated for the year ended 31 March 1979 and is as follows:

Income	
Sustaining Membership	2,640
Membership Subscriptions	5,710.17
Interest	540.94
Levies (W.A. Division only)	155
Conference profits and sale of papers	31
Total	9,077.11

Expenditure

ICA Levies	1,595
Bulletin (Includes an advance of $1000 for future issues)	2,300
Secretarial postage etc.	2,133.88
Reimbursement of fares for Councillors	400
Registered offices	203.60
Technical meetings	199.58
Insurance	74.90
Total expenditure	6,906.96
Surplus	$2,170.15

At 31 March 1979 the total assets of the Society excluding the ICA, Bulletin and N.S.W. Conference accounts amounted to $11,620.83. Almost all of these assets are in cash at the bank or in Interest Bearing Deposits.

There will be a considerable increase in the Society's income in the financial year ending 31 March 1980. This is mainly due to profits from the N.S.W. 1978 conference ($4,300) and the increase in Sustaining Membership subscriptions ($1000). A surplus of $7,600 is expected for the year and total assets at 31 March 1980 should amount to about $19,200.

ICA Finances

At the end of June 1979 the ICA account showed assets of $10,168.98. The ICA Executive Committee Treasurer reports that generally expenditure will be covered by receipts from registration, donations and funds already accumulated. However, there is expected to be a temporary shortfall in funds of $5,000 in January-February 1980. The Society is expected to advance this amount on loan. It must be emphasized that this estimate assumes that registration fees from a large number of the Australian participants will be received early in the year. If this does not occur then the Society may be required to advance a much larger sum. The budget estimates for the Society have been prepared on the basis of the ICA Treasurers estimate.

The S.A. Satellite Symposium is expected to require a further advance and $1,000 has been included in the estimate.

It is expected that N.S.W. and Vic. Divisions will be asked to advance $3,500 and $2,500 respectively to the ICA and satellite conferences. These loans may continue until after the conferences.

Since the assets of the Society are in cash at the bank or in Interest Bearing Deposits about $19,000 should be available now. This money should be retained until the financial position of the ICA is fully known.

R.A. Piesse
21 September, 1979

AUSTRALIAN ACOUSTICAL SOCIETY

CODE OF ETHICS (DRAFT)

High in the list of objects for which the Australian Acoustical Society was established is the promotion of honourable practices and of trust by the community in persons engaged in the varied fields of acoustics. To fulfill these objectives it is clearly vital that members adhere at all times, in both the letter and spirit, to a strict code of ethics. As the intent of the Australian Acoustical Society differs in no significant way from that of other learned societies it has adopted the code of ethics of the Institution of Engineers, Australia, as the basis for its code.

CODE

1. RESPONSIBILITY

The welfare, health, and safety of the community shall at all times take precedence over sectional, professional, or private interests.

In fulfillment of this requirement members of the Society shall

(a) avoid assignments that may create conflict between the interests of their clients, employers, or employees, and the public interest;

(b) conform to acceptable professional standards and procedures, and not act in any manner that may knowingly jeopardise the public welfare, health, or safety;

(c) endeavour to promote the well-being of the community, and, if overruled in their judgement in this, should inform their clients or employers of the possible consequences;

(d) contribute to public discussion on matters within the area of their competence when by so doing the well-being of the community can be advanced.

2. STRIVE TO UPHOLD AND ENHANCE THE ESTEEM, INTEGRITY, AND DIGNITY OF WORK IN ACOUSTICS

To advance the standing of the Society, members shall

(a) continue to advance their knowledge of Acoustics and actively assist and encourage those under their direction to advance their knowledge and experience;

(b) not involve themselves in any business, project, or professional or other practice of a fraudulent or dishonest nature;

(c) not use association with corporations, partnerships, or other persons to conceal unethical acts.

3. PERFORM WORK ONLY WITHIN AREAS OF COMPETENCE

In all circumstances members shall

(a) inform their employers or clients if an assignment requires qualifications and/or experience outside their fields of competence, and where possible make appropriate recommendations in regard to the need for further advice;

(b) report, make statements, give evidence or advice in an objective and truthful manner and only on the basis of adequate knowledge;

(c) reveal the existence of any interest, pecuniary or otherwise, that could be taken to affect their judgement in technical matters.

4. BUILD REPUTATIONS ON MERIT AND NOT BY UNFAIR PRACTICES

No member shall act improperly to gain a benefit and, accordingly, shall never

(a) pay nor offer inducements, either directly or indirectly, to secure employment or engagement;

(b) abrograte the principle of adequate and appropriate remuneration for work to be performed;

(c) attempt to supplant others who have been appointed;

(d) falsify or misrepresent their qualifications, experience, or prior responsibilities, nor maliciously or carelessly do anything to injure the reputation, prospects, or business of others;

(e) use the advantages of privileged positions to compete unfairly;

(f) fail to give proper credit for work of others to whom credit is due nor to acknowledge the contribution of others.

5. APPLY SKILL AND KNOWLEDGE IN THE INTERESTS OF THEIR EMPLOYER OR CLIENT

Every member shall at all times act equitably and fairly in dealing with others. Specifically they shall

(a) strive to avoid all known or potential conflicts of interest, and keep employers or clients fully informed on all matters, financial or technical, that could lead to such conflicts;

(b) refuse compensation, financial or otherwise, from more than one party for services on the same project, unless the circumstances are fully disclosed to and agreed to by all interested parties;

(c) neither solicit nor accept financial or other valuable considerations from material or equipment suppliers in return for specification or recommendation of their products, or from contractors or other parties dealing with his employer or client;

(d) advise clients or employers when as a result of their studies or investigations it is judged that a project may not be viable;

(e) neither disclose nor use confidential information gained in the course of employment without express permission of the employer or client.

At its 23rd meeting, Council agreed to put this draft Code to members for their consideration. In the absence of criticism, which should be addressed to The General Secretary, the Code will be put forward for adoption at the Society's next General Meeting.

INTRODUCING A PRESIDENT

My two year term of office has recently come to a conclusion and I am pleased to advise that Mr. R.A. Piesse is the new President of the Society.

Ray Piesse is Director of the National Acoustic Laboratory which is concerned with scientific investigation into hearing, the effects of noise on man and the provision of hearing aids to sections of the community. A Federal Treasurer and member of Council he has served the Society well. He takes on this new task with our full support and an expectation that he will preside over the 10th International Congress on Acoustics with distinction.

G.A.B. Riley
Immediate Past President

ABSORPTION DAMPING BARRIERS

ABSORPTION

SOUNDFOAM

Urethane foam developed specifically to absorb maximum sound energy with minimum weight and thickness. Used to absorb airborne noise in industrial and EDP equipment, machinery enclosures, over-the-road and off-highway vehicles and marine and airborne equipment. Meets UL 94, HF-1 flame resistance test procedure.

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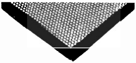
The surface pattern increases sound absorption performance 25 to 35 percent in the most critical low and mid-frequency bands when compared to other foams of the same thickness and density. Ideal solution for low frequency absorption problem. Meets UL 95, HF-1 flame resistance test procedure.



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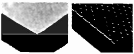

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DAMPING

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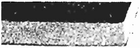
A thin (0.050") sheet of pre-cured damping compound with pressure sensitive adhesive backing. Easily and inexpensively die cut and shaped to fit and form to flat areas and simple curves.



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Consists of a thickness of embossed foam bonded to a sheet of highly efficient GP-2 damping material. Provides a single solution to damping and absorption problems.

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EPOXY 10

A quick curing resin based damping paste which can be applied by trowel or spray. Completely resistant to severe environmental conditions, including water, acid and alkalis. Popular for marine and outdoor applications.

GP-1 DAMPING COMPOUND

A non-toxic, non-flammable plastic which is applied by trowel or spray. Cures quickly in air or oven. A thin coating on steel (1/2 to 1 times metal thickness) removes tinniness and ringing.

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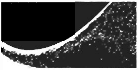

SOUNDMAT FV

Soundmat FV has 1# limp mass barrier layer bonded to a 1/4 inch layer of acoustic foam. A heavy, scuff-resistant black vinyl skin is optional. Particularly for vehicle cab floors and bulkheads. Also used as pipe lagging.

SOUNDMAT FVP

Consists of a clossed cell, hydrolytically-stable foam isolator and a layer of open cell Soundfoam M, with a lead barrier between the two. The surface is a tough, wear-resistant 1# mass for additional transmission loss.

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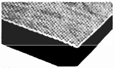

SOUNDMAT
(With perforated vinyl)

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Trains and Residential Site Noise Criteria

Anita Lawrence & Marion Burgess

Acoustics Research Unit of the Graduate School of the Built Environment, University of New South Wales.

SUMMARY

The results of measuring passby levels of over 70 N.S.W. passenger and freight trains are presented. The average maximum levels, at 17.5 metres from the tracks, were of the order of 90 dB(A) for all train types. These levels are compared with recommended criteria for residential areas and it is suggested that the most suitable criteria may be those developed for individual aircraft flyovers. Minimum separation distances between railways and residential sites are suggested, using these criteria, and these agree well with overseas guidelines. In cases where these distances are not available, additional attenuation of building envelopes may be required, and to assist in the correct choice of materials, band spectrum levels for typical trains are given.

INTRODUCTION

Increasing awareness of the impending difficulties inherent for conventional road transport, relying as it does on the world's diminishing supplies of fossil fuels, has created a new interest in alternative methods of surface transportation. Although railways too depend largely on fossil fuels, they are much more efficient users of these resources and in many places they are already available and operating.

Unfortunately, they share with other forms of transportation the characteristic of emitting high sound levels, and any increase in railway operations can be expected to have an adverse effect on surrounding residential areas.

Traditionally, railways have their terminals close to the centre of urban areas. Suburban commuter systems are used to convey passengers to and from the centres of major conurbations and the suburbs, usually the trains travel relatively slowly although some 'express' trains may operate to and from the outer suburbs. Faster, interurban trains operate over longer ranges, and these may also cater for commuters. Interstate passenger trains compete with domestic airlines for their passengers and thus speed is essential for their viability. Finally, freight trains operate over medium to long ranges.

By their very nature, the suburban railway system must travel through, or close to, residential suburbs, if it is to operate independently of other transportation systems. Although there is no need for the other types of railway to be close to these residential areas, for economic reasons these trains also share part of the suburban network. Thus residential areas are also affected by high speed interstate and interurban passenger trains and by freight trains. In order to determine typical noise levels from New South Wales trains, measurements were made alongside a main railway line in an outer suburb of Sydney. The site was chosen well away from major roads and airports, so that the noise from trains could be clearly identificed as the major source.

MEASUREMENT SITES

Most of the measurements were made at a location (called the Reference location) 17.5 metres from the centre of two sets of tracks, with the microphone 1.2 m above the ground. The railway line was substantially level and at approximately the same grade as the measurement location; there was a clear line-of-sight to the track. To one side of the Reference location the ground rose (thus the railway line was in a cutting) and to the other it fell (railway line on an embankment). Other locations used for measurement were up to 180 m from the centre of the tracks, with direct line-of-sight and with some shielding effects from the cutting. Simultaneous measurements allowed the attenuation between these more remote locations and the Reference location to be assessed.

MEASUREMENT AND ANALYSIS PROCEDURE

The train passbys were recorded on Nagra IIIB and IVSJ tape recorders, using Bruel & Kjaer Types 2209 and 2203 and General Radio Type 1933 sound level meters. A pistonphone and portable sound calibrator, as appropriate, were used to check the performance of the meters and the calibration tone was recorded to provide a reference level for replay. The tape recorder was turned on as soon as the train could be perceived and it was not turned off until the train could no longer be heard. Visual cueing was also used.

The recordings were analysed in the laboratory of the Acoustics Research Unit using the following equipment: Bruel & Kjaer Type 2603 Microphone Amplifier, Type 1612 One-third octave band filter set, Type 2307 High Speed Level Recorder and General Radio Real Time Spectrum Analyser Type 1921 with a Facit paper tape punch.

MEASURED TRAIN SOUND LEVELS

A total of 76 train passbys were recorded at the Reference location; the number of each type and the maximum passby levels are listed in Table 1.

TABLE 1

MEASURED TRAIN PASSBY LEVELS 17.5 m FROM CENTRE OF TWO SETS OF TRACKS

TRAIN TYPE	NUMBER MEASURED	MAXIMUM PASSBY LEVEL RANGE	db(A) AVERAGE
Suburban electric	43	81-102	90
Interurban electric	14	82-100	90
Freight	18	84-99	89

The train speeds were measured by timing the passage between two markers along the track; they fell within the normal range of 50-115 km/h for passenger trains and 50-100 km/h for the freight trains.

Fig. 1 shows typical level recorder traces of a freight train and a suburban electric train, measured at the Reference location and at a second location 180 m from the tracks.

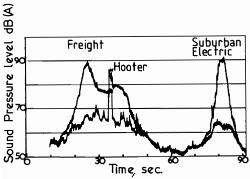

FIG. 1 Sound Level variation with time for two typical trains; one a freight train and the other a suburban electric train. The higher levels were recorded at the Reference Location and the lower levels at Location B (180 m from the centre of the tracks with direct line of sight).

By comparing the maximum levels measured simultaneously at the Reference and other locations, the attenuation obtained from distance and shielding was estimated. Table II gives these results for eight locations.

TABLE II

ATTENUATION, IN TERMS OF dB(A), FOR DISTANCE AND SHIELDING AT EIGHT LOCATIONS

LOCATION	TRACK DISTANCE (m)	ATTENUATION REF TO LOC. dB(A)	ATTENUATION PER DOUBLING OF DISTANCE
A. In line with Ref. Direct line-of-sight	150	21	2.5
B. In line with Ref. direct line-of-sight	180	24	2.3
C. 250m from Ref. direct line-of-sight, limited length of track	52.5	19	6.3
D. In line with C direct line-of-sight sight limited length of track	87.5	24	4.8
E. 100m from Ref. track in cutting	52.5	24	(8)
F. In line with E track in cutting	87.5	22	(4.4)
G. 160m from Ref. track in cutting	52.5	23	(7.7)
H. In line with G, track in cutting	87.5	27	(5.4)

There are two main sources of noise from most types of train - one is the engine, or locomotive (absent in suburban electric trains) and the other is the interaction of wheel and rails. Additional sources arising from railway operations include hooters and warning detonators when track maintenance operations are in progress. The wheel/rail interaction source approximates a 'line source' and would be expected to attenuate at 3 dB per doubling of distance from the source. It can be seen, in Table II, that slightly less attenuation was found at locations A and B, the direct line-of-sight locations. However, at location C, where the track emerged briefly from cuttings at either side, the attenuation approximated that of a point source (over 6 dB per distance doubling). At the other locations, the shield-

ing provided by the cutting amounted to an equivalent of about 8 dB per doubling of distance, for the closer locations (E and G), but this rate declined at the more remote locations (F and H).

COMPARISON OF TRAIN NOISE LEVELS AND RESIDENTIAL STANDARDS

There are three Australian Standards that are relevant: AS 1055-1978 "Noise assessment in residential areas", AS 2107-1977 "Ambient sound levels for areas of occupancy in buildings" and AS 2021-1977 "Building siting and construction against aircraft noise intrusion". The first two mentioned relate chiefly to continuous sound sources. For example, AS 1055 gives methods of rating the acceptability of intrusive noise sources compared to the background sound level. Where the existing background sound level is not relevant, tabled values may be used. These vary from 35 dB(A) at night to 50 dB(A), daytime, weekdays, for outer suburban areas. Levels more than 5 dB higher than the background are considered potentially annoying; thus levels of 90 dB(A) or so, as emitted by trains would be completely unacceptable if they occured continously.

AS 2107 provides maximum acceptable indoor noise levels, which can be translated into outdoor levels by adding 10 dB(A) to allow for typical attenuation provided by a building envelope with some ventilation openings. Continuous levels of 35 to 40 dB(A) would be acceptable at night and from 40 to 50 dB(A) during the day. These are consistent with the recommendations of AS 1055.

However, train noise is not continuous, and most train passbys are heard as individual noise events. In this way they are somewhat analagous to aircraft flyovers. If the number of operations per day is similar to that of a busy airport (say 200 or so per day) it is not unreasonable to suggest that the maximum single event noise levels suggested in AS 2021 may be an appropriate choice of criteria. These would allow 65 dB(A) for living and sleeping areas and 70 dB(A) for working areas (again, translated into ourdoor sound criteria).

Even using these less stringent criteria, it can be seen that the average train passby levels measured at the Reference location (which was outside the railway right-of-way) exceed the acceptable levels by 25 dB(A) for living and bedrooms and by 20 dB(A) for work areas. Such excesses would be expected to cause considerable annoyance. For line-of-sight locations, separation distances of 150 to 180 metres are desirable, but when some shielding is present, as when the line is in a cutting, these distances could be reduced to about 50 metres. When the line is on an embankment, however, increased separation would be necessary.

It is interesting to compare these findings with the United States Housing and Urban Development Corporation Guidelines, shown in Table III.

TABLE III

MINIMUM SEPARATION DISTANCES FOR RESIDENTIAL SITES FROM RAILWAYS

Line-of-site	Shielded	Acceptability
900m	150m	Clearly acceptable
180-900m	30-150m	Usually acceptable
30-180m	15-30m	Usually unacceptable
Less than 30m	Less than 15m	Clearly unacceptable

It can be seen that agreement with the Australian recommendations is quite good.

BUILDING ATTENUATION AND TRAIN NOISE

Many buildings are constructed closer to railway lines than appears desirable from the above discussion. If substantial increases were to occur in the number of operations, particularly at night, some people may wish to improve the attenuation provided by the building envelope (in turn creating difficulties with respect to natural ventilation). A-weighted third-octave band spectrum levels of typical passenger and freight trains are shown in Figs. 2 and 3.

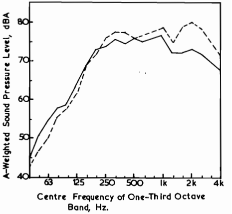

FIG. 2. A-weighted sound pressure levels in one-third octave bands for an empty freight train at the Reference Location. The broken line (- -) represents a 4 sec integration for the locomotive while the solid line (——) represents an 8 sec integration for the freight cars only.

It can be seen that freight trains have somewhat more energy than passenger trains in the lower frequencies, which are difficult to attenuate. Suburban electric

GENERAL ELECTRIC

TECHNICAL SALES REPRESENTATIVE

POSITION:	TECHNICAL SALES SPECIALIST
LOCATION:	SYDNEY
JOB DESCRIPTION:	A career vacancy exists for applicants with experience in acoustic instrumentation and the relevant standards in this industry. The successful applicant will be responsible for all aspects of application and sales of existing lines of industrial instrumentation, including a successful line of computerised noise dosimetry equipment. As well as travelling and working within Australia, applicants will be expected to travel overseas for further company training and experience, as these opportunities arise.
QUALIFICATIONS:	Applicants will be considered from people with a Certificate, Diploma or Degree in Science or Engineering, and suitable acoustic or instrumentation experience.
SALARY & CONDITIONS:	A salary commensurate with the successful applicant's qualifications, experience and motivation will be negotiated. A company car, a contributary superannuation scheme and other benefits are available.
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trains, also have peaks in the higher frequencies, around 1000Hz however these high frequency levels would not be as difficult to attenuate with conventional materials.

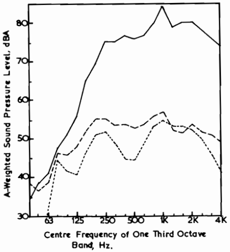

FIG. 3. A-weighted sound pressure levels in one-third octave bands for a 4 carriage, two-deck, suburban passenger train. The solid line (——) represents a 4 sec integration at the Reference Location while the broken (- -) and dotted lines (-----) represent the same integration period at locations C and D respectively.

CONCLUSION

Railways have been shown to be a source of high noise levels, comparable to those produced by other forms of transporation. Since much of the noise is the result of rail/wheel interaction it will be extremely difficult to obtain signficant reduction of emitted noise with conventional designs.

Train passbys are typically perceived as individual noise events and the analogy may be drawn with aircraft flyover noise when attempting to set acceptable noise criteria for residential sites. If this is done it is found that minimum separation distances agree well with those suggested in the US HUD guidelines.

It is evident that many people living near railways are subjected to excessive noise levels, and it could well be that, with increased awareness of noise from other sources, trains will be recognised as having the same potential for disturbance as trucks. However, it is necessary to take cognisance of the spectral distribution of train noise, if remedial actions are to be taken, in order that the most effective attenuating systems are chosen.

GOSSIP

In my last gossip column I referred to sudden proliferations of Acoustical Consultants and Acoustical Contractors; we now most definitely seem to have a proliferation of new Acoustical Consulting Businesses operated by our Members. These new businesses are detailed below in the order in which I heard of them.

MARK EISNER has established Mark Eisner & Associates in Canberra.

DAVID EDEN has established Eden Dynamics Pty. Ltd. in Sydney.

CALEB SMITH has established Caleb Smith Consulting in Newcastle; Caleb's card is notable for its pronouncement that he offers acoutical ('') engineering investigations.

Last but by no means least is the fact that after 16 years with Nonoys/Sound Attenuators I have joined with PETER KNOWLAND and ROBERT FITZELL to form Knowland Harding Fitzell Pty. Ltd. operating in Melbourne.

Sometimes acousticians tell me that they are not very well off financially and the following members assure me that their financial state can best be regarded at present as "depleted". I refer of course to BILL DAVERN and his wife who have just returned from a tour of Europe during Bill's long service leave, and PAUL DUBOUT and his wife who have not long returned from a tour of China during his leave, and to JILL HULM who has just returned from a holiday in the United Kingdom.

PETER FEARNSIDE will be leaving shortly after you receive this issue of the Bulletin to join CRIS DAY and two others, not members of the Society, to sail around New Zealand. This venture has been on the go for many months but each time the group get a boat the authorities declare it un-seaworthy, so great was the joy when recently they found one which passed.

It is a curious thing about working in acoustics that if you find yourself out of work you will find there are very limited prospects of employment as there are so few employers of acousticians. Conversely, prospective employers find there are very few prospective employees in acoustics. I understand the State Public Works in NSW has had two vacancies they have been wanting to fill for about 12 months; that a State Government Department in Queensland has two vacancies and that Sound Attenuators is still trying to get a candidate for the vacancy caused by my departure.

This column would not be complete without reporting the attempts by the State Pollution Control Commission in NSW to silence the striking clock in the Newcastle Town Hall. Apparently one dear old lady complained to the SPCC that the striking of the clock disturbed her sleep; after some investigation the SPCC found that the striking could disturb someone's sleep and hence they ordered the Council to quieten the clock between the hours of 10.00 p.m. and 6.00 a.m. The Council appealed against the notice and won but had to pay their own legal costs of $18,000 out of rate-payers funds. The clock had of course been striking for the previous 49 years without giving rise to complaints from any other citizens.

Because they are the sole correspondents with the gossip column the CARR ACOUSTIC GROUP PTY. LTD. deserve to get a mention. They wrote to me pointing out that their situation was analogous to that of the Wilkinson Murray Consulting Pty. Ltd. that was reported in the previous gossip column. The Carr Acoustic Group is in fact a new (formed July 1978) acoutic consulting service owned and operated by JIM WATSON, GRAEME MOSS and DOUG GROWCOTT.

One move away from consulting has been made by JOHN MOFFATT who has left Riley Barden and Kirkhope Pty. Ltd. to work with LEN KOSS at Monash University where he is involved with modal studies on the frames of metal working presses and the acoustic radiation form excited frames.

Finally, I must again ask all members to write to me or phone me with any tit-bits they hear. They should contact me at Knowland Harding Fitzell Pty. Ltd., 22A Liddiard Street, Hawthorn, Vic., 3122, telephone (03) 819 4818.

Graeme Harding

LETTERS

OPTIMISATION OF DUCT LINERS

If it can be assumed that duct liners react locally to the sound field within the duct, it is possible to predict attenuation relatively simply. More importantly it becomes apparent that there is an optimum specific acoustic impedance ratio which will produce maximum attenuation for a given duct configuration and frequency. As a simple example of this, the attenuation per metre is given in Figure 1 as a function of specific acoustic impedance ratio for a duct lined on two sides. The frequency of the sound is 1000 Hz and the separation between the liners is 300 mm. The optimum impedance is roughly 0.8-i0.8. The presence of a mean gas flow would no doubt cause a small variation to this optimum value.

While it is possible to establish the optimum impedance, its realisation in practice is not so easy, particularly at the lower frequencies where large negative values of the reactive component of the specific acoustic impedance ratio are usually present. At these lower frequencies too, fairly small resistive components are needed for maximum attenuation. There are of course well known ways of controlling specific acoustic impedance ratio including varying liner density, thickness, providing perforated plate surfaces, providing an air space behind the liner, etc. Alternatively, varying the duct geometry will vary the optimum impedance and this can be used to advantage.

I would be interested to learn if lined duct designers or manufacturers routinely take special precaution to control the reactive as well as the resistive component of the specific acoustic impedance ratio, or in fact if any reference is made to the specific acoustic impedance ratio at all.

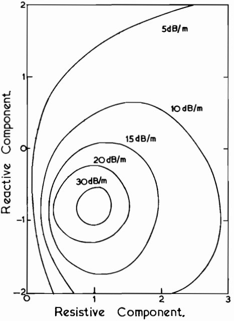

FIGURE. 1

EFFECT OF SPECIFIC ACOUSTIC IMPEDANCE RATIO ON DUCT ATTENUATION
(Separation between liners = 300mm, Frequency = 1000Hz.)

R.J. Alfredson
Monash University

Notes on Porous Materials for Sound Absorption

by D.A. Bies and Colin, H. Hansen
Department of Mechanical Engineering
The University of Adelaide, Adelaide, South Australia

Summary

The concept of flow resistance is introduced and means for its measurement are described. Measured values of flow resistance for fibrous and foamed products available in Australia are presented. Design charts which make use of flow resistance information for the calculation of statistical absorption coefficients and for increased transmission loss are also presented. Finally, it is pointed out that the information presented in this paper may be used to design sound absorptive liners for ducts using procedures described elsewhere in the literature.

1. Introduction

The sound absorptive properties of porous materials are widely recognized and used for the control of sound. Two important properties make porous materials useful for the absorption of sound and since these properties are conflicting an optimum balance is always required for best results. On the one hand a porous material must be open enough to admit sound propagation in the gas contained in the material. Closed cell materials are thus not very useful for sound absorption. On the other hand a porous material must be resistive enough to the flow through it to provide the viscous dissipation which ultimately absorbs the sound. For a large class of porous materials characterization of their resistance to through flow under steady state conditions is quite sufficient, as will be shown, to characterize their acoustical performance for all of their typical uses. Fortunately the resistance to through flow of a porous material under steady state conditions is easily measured. In fact, for a large class of porous materials measurement is not even necessary. A knowledge of the fibre diameter of the material is quite sufficient where the fibre diameter range is fairly well controlled.

Various authors have contributed to the general fund of knowledge about sound propagation in porous materials which information is fundamental to the successful use of porous materials as sound absorbents in their several typical applications. Zwikker and Kosten wrote the first definitive treatise on the subject suggesting a number of fundamental concepts basic to later work. (1) Bies subsequently showed how the basic scaling parameter introduced by Zwikker and Kosten, a kind of acoustics Reynold's number, could be used to completely characterize any porous material. (2) Subsequently Delaney and Bazley investigated a large range of porous fibrous materials and showed that all of their acoustical properties could be described in terms of a frequency parameter based upon the flow resistivity of the material. (3) It may readily be shown that the scaling parameter of Zwikker and Kosten and Delaney and Bazley are in fact one and the same. (4)

The procedures to be described in these notes will be based upon the experimental work of Delaney and Bazley guided in part by the work of Bies. Thus the excellent theoretical work of Scott (5) and Beranek (6) on the subject of sound propagation in porous materials will not be used. It must be pointed out, however, that for very soft porous materials the work of Beranek as reformulated by Bies might be expected to give better results. (7).

Thus implicit in the discussion to follow is the assumption that the porous material considered is not very soft.

2. Flow Resistance and Flow Resistivity

The means and conditions for the measurement of flow resistance of a porous material are described in an American standard (Australia has none). (8) The apparatus prescribed by the standard provides a means for applying a small differential pressure across a uniform layer of material under test and means for measuring both the induced differential pressure and the induced fluid volume flow per unit area through the test sample. The latter quantity which has the dimensions of velocity may be thought of as the normal velocity at the test sample surface. The flow resistance R of the sample is then defined as the ratio of the pressure differential p divided by the normal gas velocity v at the surface of the sample.

$$R = p/v \qquad (1)$$

We note that equation (1) implies very small values of p and v as required by the standard and as characteristic of acoustic phenomena at ordinary sound pressure levels.

Experimentally it is found that for fibrous materials the flow resistance of a sample ℓ thick of fibre diameter d is

$$R = f_1(\rho_m/\rho_f)\ \mu\ell/d^2 \qquad (2)$$

In equation (2) μ is the gas viscosity, ρ_m is the bulk density ρ_f is the fibre density and f_1 is an empirically defined function which for the fibre glass products is

$$f_1(\rho_m/\rho_f) = K\ (\rho_m/\rho_f)^{1.53} \qquad (3)$$

In equation (3) the value of the constant K is 3.18×10^{-9} when the fibre diameter d is in metres, the densities ρ_m and ρ_f are in kg/m^3 and the flow resistance R is in MKS rayls.

We note the linear dependance of flow resistance upon sample thickness as given by equation (2). This leads to the definition of flow resistivity R_1 as

$$R_1 = R/\ell \qquad (4)$$

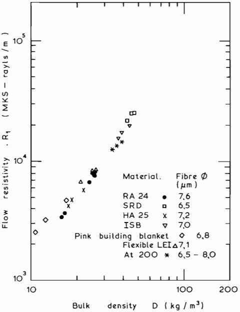

Figure 1 Measured flow resistivity ACI Fibre-glass.

Using apparatus which comples with the requirements of American standard ([8]) Bies and Hansen have systematically measured the flow resistances of Australian made fibrous and foamed products. ([4]) In the former case an attempt has been made to be exhaustive. The results of those measurements are shown in Figures 1 to 5 inclusive. We note that in the case of the fibrous materials the trend in each case is as predicted by equestions (2) and (3). No trend is indicated by the data for the foamed products shown in Figure 5.

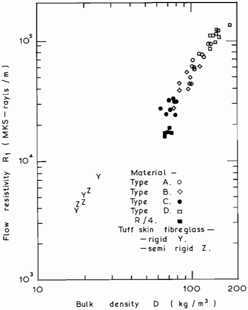

Figure 2 Measured flow resistivity Bradford Insulation Rockwool.

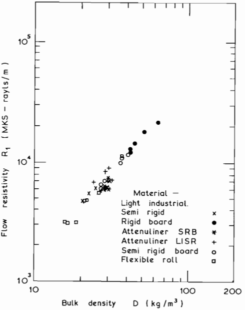

Figure 3 Measured flow resistivity Australian Gypsum Insulwool.

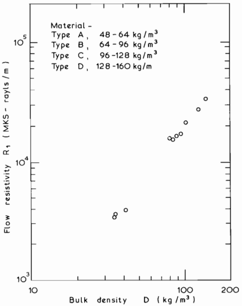

Figure 4 Measured flow resistivity Siddons Insulation.

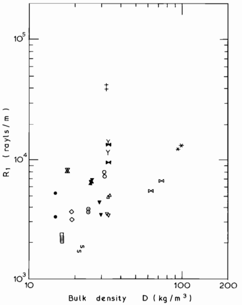

Figure 5 Measured flow resistivity for Olympic Foam products. All samples tested were 50 mm thick.

For the case where no measured data are available the flow resistance for fibre glass materials may be estimated using Figure 6. All

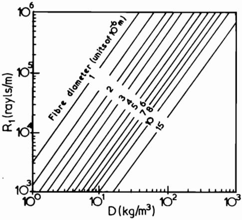

Figure 6 Flow resistivity as a function of bulk density and fibre diameter courtesy of Owens Corning Fibreglass, U.S.A.

that is required is the fibre diameter. The figure follows from equations (2), (3) and (4). Alternatively a measurement of the flow resistance may be used to determine the mean fibre diameter of a sample.

3. Reverberation Control in Rooms

One of the frequent uses of porous materials is for the control of reverberant sound in an enclosure or room. When a porous material is used for this purpose it is commonly mounted on the walls of enclosures and on the ceiling and walls of rooms. When used in such a way it is generally assumed that sound will be incident upon the absorptive material from all directions. Under such circumstance the sound absorptive property of the porous material is described by its statistical absorption coefficient, the latter quantity being defined as the fraction of incident energy which is absorbed.

Morse and Bolt have considered the calculation of statistical absorption coefficient at an absorptive wall in terms of the normal specific acoustic impedance at the wall. [9] Bies and Hansen in turn have considered the calculation of the statistical absorption coefficient using the formulation of Morse and Bolt for a layer of porous material ℓ thick backed by an air cavity L deep with the results shown in Figure 7.[4] Review of the data in the figure shows that the effect of the backing cavity is to improve the low frequency absorption of the porous layer. In fact when the backing cavity depth L is equal to the porous layer thickness ℓ the absorption coefficient of the porous layer cavity backed combination exhibits the same behaviour as that of an unbacked layer twice as thick. We note also that a further increase in the depth of the backing cavity introduces an undesirable dip in the absorption curve. We conclude

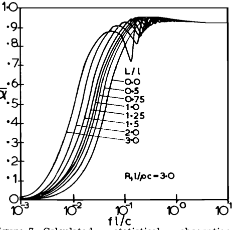

Figure 7 Calculated statistical absorption coefficient for a porous layer ℓ thick backed by a cavity L deep as a function of the frequency parameter. The flow resistance parameter in this case is $R_1\ \ell/\rho c = 3.0$.

that for optimal absorption a backing cavity equal in depth to the thickness of the porous layer is required.

The range of flow resistances shown in figure lie about three. Further calculations not presented here have shown the following behaviour.(4) If the flow resistance of the porous layer is much less than three the attenuation of sound in the material will be too small. The absorption coefficient will diminish and it will be characterised by large fluctuations in value due to standing wave effects. If the flow resistance is much greater than three the resistance to sound propagation in the material will be too high. Again the absorption will diminish because now the sound is reflected from the surface rather than allowed to enter and be absorbed. These considerations suggest a second criterion for optimum sound absorption. The flow resistance of the porous layer should be about 3 ρc.

If measured and calculated values of the statistical absorption coefficient were in agreement all would be well. Unfortunately, values for statistical absorption coefficient as measured according to standard procedures in a reverberant room are regularly greater than predicted. In fact recognition of the discrepancy on the one hand and a lack of explanation on the other has lead to a different name for the measured quantity. The measured absorption is called the sabine absorption and it has the interesting property that it can have values greater than unity. Measured values for a commercial product are shown in Figure 8. The porous material called Sillan is nominally 50 mm thick and it has a flow resistance of 4 ρc. The data shown in the figure are composite values obtained from many measurements in many reverberant rooms. (10)

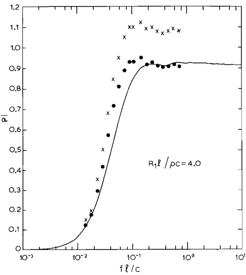

Figure 8 Absorbtion coefficients for the commercial rockwool product Sillan, plotted as a function of a frequency parameter.
- = predicted statistical absorbtion coefficient.
x = measured Sabine absorbtion coefficient.
• = adjusted Sabine absorbtion coefficient.

In Figure 8 for comparison with the measured values of the sabine absorption we have plotted the predicted values of the statistical absorption coefficient. If we suppose that the sabine absorption values are all too high for some as yet unexplained reason and we introduce an arbitrary correction factor of 0.83 to all of the measured values the corrected values are then in reasonably good agreement with the predicted values. We conclude that the parametric dependences indicated above are reliable even if we are not able to predict the magnitudes correctly.

4. Transmission Control through Enclosures.

Noise control may sometimes be effected by wrapping the noisy item with a layer of porous material. A second impervious layer might then be applied. Alternatively the cavity between two facing panels of an enclsoure may be filled with a porous material to improve the noise reduction of the enclosure. In each case the porous material is called upon to attenuate the sound passing through it.

To proceed with analysis it will be advantageous to identify three frequency ranges. (11) In the low frequency range the thickness of the porous layer will be less than one tenth of the wavelength of sound propagating in a medium characteristic of the porous material.

Figure 9 is useful for identifying this low frequency range. When the design frequency parameter lies below the upper bound indicated the frequency is in the low frequency range and Figure 10 may be used to estimate the expected transmission loss.

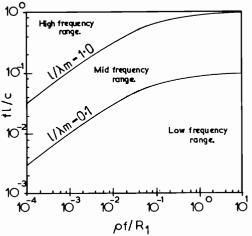

Figure 9 Limits showing when low and high frequency models should be used for estimating the transmission loss through a porous layer. The low frequency model should be used when the design point lies below the $\ell/\lambda m = 0.1$ curve and the high frequency model should be used when the design point lies above the $\ell/\lambda m = 1.0$ curve.

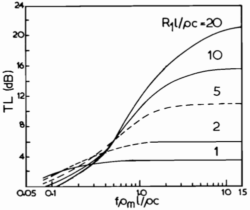

Figure 10 Transmission loss through a porous layer for a design point lying in the low frequency range of Figure 9.

In the high frequency range the thickness of the liner is greater than a wavelength of sound propagating in the material. Again Figure 9 will be useful for determining this range. In this case there are three possible loss mechanisms. Loss may occur on reflection at the front face, on transmission through the material and on reflection at the back face. Figure 11 may be used to estimate the propagation loss while Figure 12 may be used to estimate the reflection loss at either face.

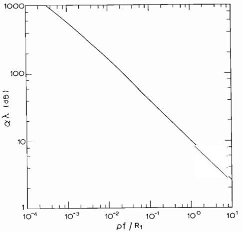

Figure 11 Propagation loss (dB per wavelength of thickness) through a porous layer for a design point lying in the high frequency range of Figure 9.

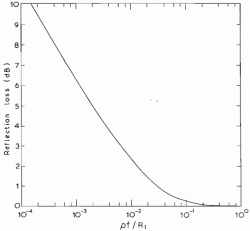

Figure 12 Reflection loss (dB) at a porous material - air interface for a design point in the high frequency range of Figure 9.

If the porous layer is free hanging then two reflections will occur and the net loss is the sum of all three losses as determined using Figures 11 and 12. If the porous layer is wrapped, for example on to the surface of a pipe, so that there is no reflection at the front face then the net loss is the sum of the propagation loss and the single reflection loss at the exit (back) surface. Finally if the porous layer serves as a filler so that there are no reflections the loss is entirely due to propagation.

The mid frequency range behaviour is estimated by fairing a curve through plotted values for the low and high frequency ranges.

5. Propagation Control in Ducts

The use of porous materials as a lining to control the propagation of sound in ducts is well known. The design of such devices depends upon a knowledge of the flow resistance of the lining material. Design procedures which are not critically dependent upon the choice of flow resistance are discussed in reference ([12]). Designs for very high performance are possible and they are critically dependent upon the choice of flow resistance. Design procedures for very high attenuation rates for the case without flow are discussed in reference ([11]). Unfortunately such design is very sensitive to the effects of flow but discussion if this point is beyond the scope of this paper. ([13])

6. Acknowledgement

Support for this work as part of a grant from the Department of Labour and Industry of South Australia is gratefully acknowledged.

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TECHNICAL NOTES

THE UNIVERSITY OF MELBOURNE COCHLEAR IMPLANT FOR PATIENTS WITH PROFOUND OR TOTAL HEARING LOSS

Clark, G.M., Tong, Y.C., Patrick, J.F. and Black, R.C.

Research workers over the last 150 years have entertained the possibility of restoring total hearing loss by electrically stimulating residual hearing nerves. Many have contributed to the understanding of the subject.

Our own interest in the subject commenced in 1968 when it became clear that a number of basic studies needed to be undertaken if patients were to receive help this way. It was first necessary to establish what the limitations of single electrode stimulation were in conveying frequency and amplitude information before considering the development of a multiple-electrode implant. Acute physiological experiments in 1969 by Clark, and studies on the behaving animal by Clark et al. in 1972 established that there would be severe limitations in conveying speech with a single electrode system, and that a multiple-electrode cochlear implant provided the best change of enabling a deaf patient to communicate.

This was designed to provide 10-15 channels of stimulation, and independent control of the phase and amplitude of the stimuli to the individual electrodes. Power and data are transmitted by inductive coupling at frequencies of 112 kHz and 10.752 kHz respectively. It also has a connector that can enable the receiver-stimulator unit to be replaced if necessary (Clark et al, 1977). The receiver-stimulator and connector are shown in Figure 1.

The low-noise building.

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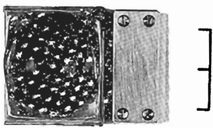

Figure 1. (Clark et al, 1977). The prototype receiver-stimulator assembly prior to being conformally coated. Scale = 1 division = 1 cm.

Consequently, in 1973 it was decided to develop a multiple-electrode cochlear implant.

There were in addition many histological and surgical developments that were required before the device could be implanted in a patient. An appropriate surgical approach was needed that would enable a number of electrodes to be placed close to groups of residual auditory nerves with a minimal degree of damage. Initially it was found possible to pass a flexible electrode around the turns of the cochlea by inserting it through an opening drilled in the apical turns (Clark et al. 1975). Further work, however, led to the development of a flexible multiple-electrode array that could be inserted for a distance of 20-25 mm around the scala tympani by introducing it through the round window membrane (Clark et al. 1979a). This has now been adopted as our standard approach as our histological studies on experimental animals showed that this approach also resulted in less damage to residual auditory nerve fibres (Clark, 1977). With an electrode array in the scala tympani there is, however, a problem in localizing the current to a group of nerve fibres and avoiding spread along the low resistance pathway in the scala. Therefore, research was undertaken to determine an effective means of isolating the current, and it was found this could be done by bipolar stimulation. (Black and Clark, 1977); (Black and Clark, 1978).

As a result of these and other studies it was considered appropriate to implant a receiver-stimulator, connector and electrode array in a patient with post-lingual deafness. This was carried out on 1st August 1978. The details of the operation are described by Clark et al (1975b) and it was found possible to provide an adequate site for the electronic package in the mastoid bone. Since the operation the patient has had a number of psychophysical tests to determine the range of pitch and loudness perception. The results which have been published (Tong et al., 1979) show that the multiple-electrode system is effective in conveying different vowel colours depending on the electrode stimulated, and is therefore a better system than single electrode cochlear implants. This work also indicated that a formant vocoder would provide the best chance of a patient understanding running speech. A formant vocoder strategy has been incorporated into a computer program, and it has been found possible for the patient to understand running speech and converse about subjects with which he is very familiar. This can be done without lip reading and with minimal rehabilitation. Further rehabilitation is proceeding and work is being done to improve rehabilitation methods.

We would like to acknowledge generous financial assistance from the Channel 0 Nerve Deafness Appeal, National Health and Medical Research Council of Australia, the Department of Productivity, Lions International, Charitable Trusts and Foundations.

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DIVISION REPORTS

WESTERN AUSTRALIA REPORT

1. Divisional Office Bearers and Committee

The committee elected at the 1979 Annual General Meeting is as follows:

Chairman:: Mrs. Marie McCudden
Vice Chairman: Prof. Brian Johnston
Treasurer/Registrar: Mr. John Spillman
Hon.Secretary: Dr. Ian Bailey
Committee: Dr. Val Alder
Mr. Fred Jamieson
Dr. Derek Carruthers
Mr. Norbett Gabriels
Miss Pam Gunn
Mr. Tibor Vass

Federal Councillors: Mrs. Marie McCudden
Mr. Tibor Vass

2. Committee Meetings have been held on 14th June, 3rd July, 6th August and 3rd September.

3. Technical Meeting

April 18th, 1979

Guest Speaker Dr. N. Holmes, Department of Physics, W.A.I.T.

Topic Use of an Acoustic Sounder for Atmospheric Monitoring

July 17th, 1979

Guest Speaker Dr. June Miller, University of Kansas.

Topic Audiology Tomorrow.

4. Annual General Meeting was held on June 14th.

5. Membership

Honorary Members	1
Members	31
Affiliates	1
Subscribers	5
Students	6
Leave of Absence	-

6. Financial Statement

The Treasurer reported a credit balance of $766.85 in the general account and $800.00 in an interest bearing deposit as of the 3rd September, 1979.

7. 10th I.C.A. Satellite Symposium

The Audiological Society of Australia and the Otolaryngological Society of Australia have both agreed to act as co-sponsors of the Symposium. As yet no reply as been received from the Australian Physiological and Pharmacological Societies.

Financial support has been sought from nine business companies. In response, Mt. Newman Mining Company will donate $1,000 while two other companies have indicated they are unable to assist.

A budget has been prepared which shows that the break even point is a 100 registrants paying a fee of $75.00.

Of the twelve possible invited speakers, Dr. Dixon Ward has accepted. Dr. Hunter-Duvar and Dr. G. Bock have accepted providing financial assistance can be obtained.

Marie J. McCudden
(Division Chairman)

VICTORIA DIVISION DIARY

A.B.C. Ripponlea Visit

The 40th Technical Meeting of the Victoria Division was held at the Australian Broadcasting Commission Television Studios in Ripponlea on Thursday, 9th August. It took the form of a very interesting and informative tour of the studio complex.

After dining in the ABV-2 canteen, the Victoria Division members were briefed on the facilities operating at Ripponlea, and then were taken on a comprehensive tour over the studio complex. The tour included studios, film dubbing suite, staging, make-up, studio and master control, telecine and video-tape facilities.

Working on Draft Australian Standard

On the 23rd August, a workshop was arranged by the Victoria Division to consider and comment on the Draft Australian Standard for Noise Control on Construction and Demolition Sites.

There were nine Workshop members representing the Master Builders Association, Australian Federation of Construction Contractors, Acoustical Consultants, State Electricity Commission of Victoria, Environment Protection Authority and General Industry. Mr. Bruce King who was a member of AK-9 Committee working on this Draft Standard kindly accepted the position as Chairman of the Workshop Panel.

From the workshop study group discussion, there were various comments which are to be forwarded to the Australian Standards Association on behalf of the Victoria Division, for their consideration.

Geoffrey Barnes,
Victoria Division Bulletin Representative

N.S.W. DIVISIONAL REPORT

1. Divisional Committee

The Annual General Meeting of the N.S.W. Division was held on Friday, 1 June, 1979, and one of the important items of this Meeting was the election of Committee Members for the year 1979-1980. As three retiring Members were known to be unwilling to accept renomination an attempt was made to increase involvement in the voting by calling for nominations in advance of the meeting. The success of this can be gauged from the need to only nominate one more person at the time of the meeting. Two new members on the Committee are Ken Mott and Peter Kotulski. John Whitlock has returned to the Committee after a break of a few years. Following the July meeting the membership of the Committee is:

Marion Burgess	(Chairperson)
Ted Weston	(Vice Chairperson)
George Patterson	(Secretary)
Michael Kateifides	(Treasurer/Registrar)
Ken Mott	(Committee Secretary)
Peter Kotulski	(Technical Subcommittee)
Ray Piesse	(Membership Subcommittee)
Bruce Gore	(Education Subcommittee)
John Whitlock, Anita Lawrence	

The Committee continues to meet on the first Wednesday of each month. Some of the matters being examined by the committee include misleading advertising, code of ethics, local council requirements for acoustic measurements, retiree members and other matters arising from correspondence.

2. Technical Programme

The technical subcommittee have had a few problems in achieving the aim of one Technical Meeting each month for most of the year. The extensive mail strike in July and the petrol supply restrictions in June led to the cancellation of these meetings.

A very successful visit to National Measurement Laboratory was held in April and the Annual General Meeting and Dinner in June was well attended. In August, Dr. Bob Harris from the Australian Atomic Energy Commission, presented a talk on Noise Analysis and explained the methods and instrumentation now available for specific types of Noise and Signal Analysis. Mr. Thiele, from the ABC, spoke on Loudspeakers and their Enclosures at the September Technical Meeting.

3. Membership

The current Membership of the N.S.W. Division is 126 and all on the mailing list were sent Membership Application form, Information Sheet and accompanying letter as part of a membership drive. Eleven applicants have recently been considered by the Membership Grading Committee and six have been referred to Council while the others are supplying additional information.

4. Education

Many requests for further information have been received following the entry in N.S.W. Vocational Guidance Publication. There has been some response to the advertisement in the Bulletin regarding the book purchasing arrangement through the U.K. The account will be continued in the hope that more requests will be received as the financial advantages become more widely known.

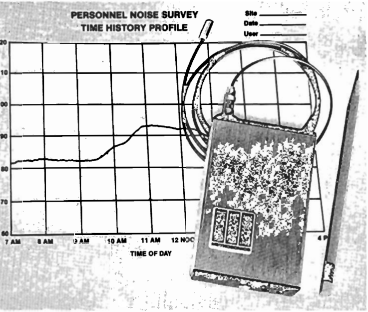
NEWS FROM S.A. DIVISION

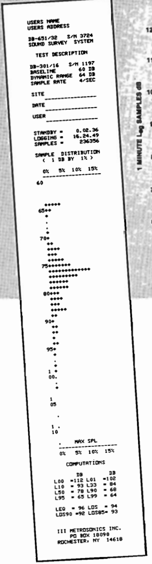
Following what was intended to be the third Annual General Meeting of the South Australian division of the Australian Acoustical Society, Tristram Cary, a Reader in Music at the University of Adelaide, presented a lecture / demonstration entitled "Computer Music Comes to South Australia". The Annual General Meeting was, in fact, adjourned due to the lack of a quorum, however, those present at the supper provided by the University Staff Club were subsequently treated to an informative and enjoyable introduction to computer music. The venue for Mr. Cary's talk was the imposing Elder Hall; a building which has only recently been refurbished. There was a large number of people present including many students and staff from the Music department.

A brief history of computer music was given initially, with a description of the early work of the 1950's and the enormous development that has taken place since. Particular reference was made to the recent work at the Centre for Computer Research in Music and Acoustics (CCRMA) at Stanford University at which the speaker had spent some time. As well as the music orientated description the mathematical basis of the various means of generating music by computer was given. This, in particular, proved very interesting to those not previously aware of the generation mechanisms.

Progressively through the talk, the audience was given demonstrations illustrating the various points. This included the playback of tape recorded multi-channel synthesized music, some of which was composed by Mr. Cary. Unfortunately, 4 - track playback equipment was not available to do justice to the recordings, but the performance was very well received. The live demonstrations were performed using the Music Department's recently acquired digital music synthesiser which is the only machine of its kind in the Southern Hemisphere. The machine is based on the ABLE 40 computer which is a high speed, 16 bit asynchronous processor made by New England Digital Corporation in Vermont. It has various modes of operation, including playback of stored music from the computer's memory, control of external music devices by the computer and real time interaction with the computer. The synthesiser itself is capable of generating samples up to 60 kHz.

Adrian D. Jones





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TENTH INTERNATIONAL CONGRESS ON ACOUSTICS

REPORT OF 10 I.C.A. EXECUTIVE COMMITTEE SEPTEMBER 1979

As foreshadowed in the last report, quotations were sought from professional conference management services for the provision of specified services in the organization of the Congress. Five companies submitted quotations, and after analysis of the offers, an agreement was signed with International Convention Management Services in April. Since then, a representative or representatives of the company have attended all committee meetings, and the company has assumed most of the co-ordination and clerical workload. There have also been minor changes to the sub-committee structure, for example an Accommodation Sub-Committee is no longer required since such bookings are included among the duties of I.C.M.S.

The Second Circular was prepared and distributed, and included a call for papers and forms for submission of abstracts. The circular was mailed to all those (approximately 1100) who had returned reply cards from the first circular, and to all members of the Australian Acoustical Society and the Audiological Society of Australia. Qantas and several foreign acoustical societies provided assistance in distribution of the circular. A total of 3000 copies were printed, to allow for distribution at meetings such as the Inter noise and ASA conferences to be held later this year.

A large number of technical journals likely to be read by people with an interest in acoustics have been approached regarding publicity for the Congress.

A draft overall programme for the Congress has been prepared. This incorporates technical sessions, technical visits, exhibition and social events. With regard to the technical programme, a number of invitations were issued to proposed speakers for plenary sessions and to date there have been four acceptances. For structured sessions, four proposed organizers have accepted invitations, while the other four sessions have still to be finalised. Technical tours have been arranged at a number of establishments. The Congress will be opened by the Governor-General and a contract has been signed with the Sydney Opera House Trust for the use of the Concert Hall for the Opening Ceremony. Entertainment for the Opening Ceremony is still being investigated, but Executive Committee opinion at present favours a performance by aboriginal artists. Bookings have been made for the Congress banquet and farewell cocktail party, and a block booking has been made for an ABC Concert at the Opera House.

Contact has been maintained with the Catgut and Musicological Societies regarding their proposed associated meetings. An associated meeting will be held by the Australian Ultrasonics Society immediately after the I.C.A., and a meeting on physical ultrasound will be held in India, in association with the Congress.

The response to the appeal for financial support which was made to companies and departments has been disappointing, and it was noted by the ICA Commissioners that the Australian contribution towards the cost of running the Congress appears to be much lower than the usual contribution by host-countries. A follow-up letter requesting donations will be sent to those organisations which have not acknowledged the first letter, and it is proposed to establish a fund-raising Committee.

Initial response to the publicity circular for the Technical Exhibition was pleasing, but there have been no further bookings of space since preparation of the last report to AAS Council. A follow-up letter will be prepared in this area also in an effort to obtain bookings for the remaining ten stands.

Advice has been received from the Standards Association of Australia that they expect to receive firm advice soon that technical committees concerned with acoustics of both ISO and IEC (C43 and TC29 respectively) will meet in Sydney in conjunction with the Congress.

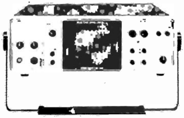
LATE NEWS

1. Extended deadline for receipt of abstracts - The new deadline for receipt of abstracts, on the form accompanying Circular No. 2, is MID-JANUARY 1980. Copies of Circular No. 2, or additional abstract forms, are available from the Secretariat the following address:

   10 ICA CONGRESS SECRETARIAT
   GPO BOX 2609
   SYDNEY, NSW, 2001

   Those intending to submit a paper for the free paper sessions should return the card enclosed with the Second Circular indicating paper title and category as soon as possible.

2. Governor-Gnereral to Open Congress - The 10th ICA Congress will be officially opened by Sir Zelman Cowen, Governor-General of Australia, AK, GCMG, K St J,



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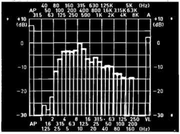

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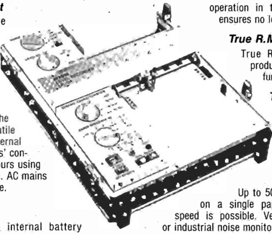

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QC at a cermony in the Concert Hall of the Sydney Opera House on Wednesday July 9, 1980.

3. Call for Contributed Papers - 10 ICA Satellite Symposia

The deadline for receipt of abstracts has been extended to MID-JANUARY 1980. Please send abstracts (approximately 200 words, typed on A4 paper, to the following address. Abstracts should clearly show the title of the Satellite Symposium, author's name and mailing address.

ADELAIDE, July 7 and 8, 1980:
"ENGINEERING FOR NOISE CONTROL"

Send abstracts to:

Dr. D.A. Bies
University of Adelaide
Mechanical Engineering Department
GPO Box 498 D
Adelaide, SA,
Australia 5001

PERTH, July 18 and 19, 1980:
"BASIC CAUSES OF NOISE DEAFNESS"

Session topics: "Physiology and Anatomy of Noise Deafness", "Experiments in Noise Deafness", "What Sort of Noise Actually Causes Deafness?".

Send abstracts to:

Prof. B.M. Johnstone
Department of Physiology
University of Western Australia
Nedlands, WA,
Australia 6009

BOOK REVIEWS

"THE IMPACT OF NOISE POLLUTION"

"The Impact of Noise Pollution" by George Bugliarello et al, is a recent addition to the Pergamon International Library of Science, Technology, Engineering and Social Studies. It is sub-titled "A Socio-Technological Introduction", a title which leads us to expect a book which deals not only with noise and its many sources, but also with its effects on us in our various daily activities. A look at the Contents shows that we will not be disappointed.

The authors - a team of four drawn from the widely diverse fields of bioengineering, social psychology, housing research and technological design - have written this book "not for the specialist but for the layman who as decision maker and citizen is called upon every day to form opinions and to make intelligent decisions about the ubiquitous and ever more serious problem of noise". To this end the book had been divided into seven main parts whose titles show the extensive field covered: The Socio-technological Problems of Noise (pp 3-20); The Effects of Noise on Health (pp 23-77); Surface Transportation Noise (pp 81-156); Aircraft Noise (pp 159-214); Occupational, Domestic and Leisure Noise (pp 217-291); The Political Economy of Noise (pp 295-376); and Conclusions (pp 379-389); together with three Appendixes (pp 393-424) covering "Measures and Indexes of Noise and Annoyance", "Technological Forecasting for Noise Control" and "Environmental Impact Statements for Noise".

As a book designed for laymen rather than specialists, this coverage is suitably wide ranging. The techniques for measuring noise, and then reducing it either by attacking it at its source or by modifying the transmission path between source and hearers are amply illustrated. Each main part of the book contains useful chapters on the various aspects of its subject matter.

As a book for laymen it has the advantages of covering a wide variety of subject matter. This has been gained at the expense of some lack of depth on any particular subject. The specialist, therefore, will find little detail on, to name topics at random, the effects of impulsive noise on hearing loss, or the production of wheel rumble noise by a steel wheel rolling on a steel rail.

Other features of the book are the lists of references included at the end of each chapter, the Name and Title Index, and the extensive and helpful Subject Index.

Like all books, this book also must be read against the question, "Is this true?", with the putting of the information selected to practical test. The contents of this book mostly come through this test well, though it is possible to find some judgements questionable, as for example the comments on Transport Noise Index (TNI) on pp 395 and 408. Another reservation is that the expression is not always clear. On p 23 we might more correctly expect to read that "one can hear another person only if he raises his voice" (lines 3, 4), or on p 25 that "men suffer greater hearing loss than women" rather than "men have worse hearing than women"!! (lines 5, 6). But these are minor reservations.

As a whole we may conclude that "The Impact of Noise Pollution" is a useful text which bridges the gap between laymen concerned with noise problems and the professionals and specialists working on its measurement and suppression. It gives somewhat wider coverage of this field than the very useful "General Radio Handbook of Noise Measurement" but without the specialist detail of, for example, Kryter's "The Effects of Noise on Man" or Cyril Harris' classic "Handbook of Noise Control".

C.L. Fouvy

ACOUSTO-OPTICS

by

J. Sapriel, John Wiley & Sons, 1979

(first published L'acousto-Optique, Masson, Ed., Paris, 1976).

Given the current interest in fibre optics for telecommunications this is a timely publication. The text is an excellent introduction to the subject of acousto-optics for the graduate student in Physics or Engineering, assembling and focussing in a concise manner (100 pages) the theoretical fundamentals of acoustic -optic devices.

The book begins with a brief but comprehensive introduction to acoustic theory -tensors, elasticity, propagation of acoustic waves and transducers. The treatment is well presented, the mathematical derivatives being clearly explained and related to their physics significance, but some prior experience of tensors and crystallography would be more than helpful (viz. J.F. Nye - Physical Properties of Crystals, Clarendon, 1960). The text moves on to treat photoelasticity and the diffraction of light by acoustic waves in the same concise manner. The penultimate chapter deals with the practical realisation of acousto-optic coupling and the last chapter examines some of the many substrates that have potential in this field. These last two chapters present relatively up to date accounts of the more recent developments in the field (the most recent references having been published in 1974) although the late publication in English has not helped in this respect.

J.I. Dunlop

MASTER HI-FI LOUDSPEAKERS AND ENCLOSURES

by

D. Berriman, Newnes Technical Books, U.K., 1979, 128 pp. ill, index.

This book is a cross between a "do-it-yourself" book and a serious reference book with the genes of the "do-it-yourself" side of the family being dominant.

The book sets out to answer questions such as 'How do loudspeakers and enclosures work?' and, 'What are the advantages of different types of speakers and enclosures?'. As such it gives a basis for the selection of loudspeakers and it gives information on designing and building enclosures, but the design would hardly be an optimum one, except perhaps on the basis of Beranek's criterion, i.e. 'The best loudspeaker enclosure is the one you build yourself'.

Fergus Fricke

STANDARDS & REGULATIONS

STANDARDS REPORT

The Association's Acoustics Standards Committees continued to be active during the period under report.

The Association is pleased to announce a new Miscellaneous Publication - MP44, Guide for the Use of Sound Measuring Equipment, Part 1 - 1979, Portable Sound Level Meters. This is the first part of a publication dealing with the use of sound level meters for making objective sound measurements according to standardized procedures. Guidance is given on types of sound level meters, types of sounds and how they are identified, measurement techniques and reporting of the information obtained. Calibration of the equipment is also described. The Association believes that this publication will be useful to the members of the Australian Acoustical Society. The cost of this publication is $6 and is available from the offices of the Association in capital cities and Newcastle.

A new public review document DR 79158, Draft Standard for Noise Control on Construction and Demolition Sites was issued on 1st October, 1979. This draft standard is concerned with noise from construction, maintenance and demolition sites as it affects persons working on these sites and also those living and working in the neighbourhood. This draft provides guidance in noise control on such sites and includes guidance in investigation and identification of noise sources, measurements of sound and guidance in assessment with a view to planning measures for noise control and monitoring of their effectiveness. This draft standard was considered by the Australian Acoustical Society, Victorian Chapter, in a workshop held during August 1979 in Melbourne with Mr. R. Bruce King, Consulting Engineer, Melbourne, and Chairman of the SAA committee responsible for this draft in the chair. The discussions at this conference were useful and will be taken into account in finalizing this draft standard early next year. The latest date for receipt of comments on the draft standard DR 79158 is 21st December, 1979. Members of the Australian Acoustical Society may obtain a free copy of this draft form the headquarters of the Association or any of the branches in capital cities and Newcastle for study and comments therein, which may be advised in writing to the Association.

The other standards activities in progress include the following:

1. Revision of AS 1633, Glossary of Acoustic Terms. A draft revision will be issued for public comment early.

2. A new standard for personal noise dosemeter based on the public review document DR 77096 has been finalized and will be published later this year. This standard will be of assistance to the noise control authorities, public health departments, industry associations, factory owners, acoustic consultants and manufacturers and sellers of sound measuring equipment.

3. Work is in hand to amend AS 1269 - 1979, especially Appendix D dealing with incidence of hearing impairment in employees exposed to noise.

4. In the area of architectural acoustics, a public review document for a draft method for laboratory measurement of airborne sound attenuation of ceilings by two room method is to be issued for public comment shortly. A new standard on the method of reverberation time in enclosures based on public review document DR 78156 will be published early next year. A new draft on speech privacy and intelligibility will also be issued for public comment early next year.

5. In the area of community noise, work is in progress on the revision of AS 1055, Noise Annoyance in Residential Areas, to include more sophisticated methods of measurement of noise and to generally align our standard in line with the proposed revision of the equivalent International Standard ISO 1996. Work has been initiated on the preparation of a new document on measurement and prediction of traffic noise.

6. In the area of shipping noise, the committee is considering preparation of a document on noise levels emitted by vessels in waterways, ports and harbours. Acount is taken of AS 1949 dealing with the measurement of airborne noise emitted by vessels in ports and harbours, the work of IMCO and UNESCO Inland Transport Committee on Vessels, and the work in the USA noteably of SAE and EPA.

7. The committee on noise from agricultural and earthmoving machinery is working on a draft method of measurement of airborne noise from lawnmowers and edge cutters. It is proposed to provide a method of measurement of airborne noise in terms of sound level at by-stander position at 7.5 m distance and at the operator's ear level. It is also proposed to include the method of calculation of sound power level in this document. This document is expected to be issued for public comment early next year.

8. The question of annoyance from airconditioner noise in residential areas especially from room airconditioners was considered by an ad-hoc committee of the Association's Acoustics Standards Committee. Note was taken of the work of the Interstate Noise Control Committee on the method of prediction of noise levels from the above type of airconditioners in progress, which will be largely based upon the method in use in Western Australia and South Australia. It is proposed to modify the method of measurement of noise in AS 1861, Refrigerated Room Air Conditioners, giving due consideration to the provision of two speeds and relating thermal capacity and speed and taking note of tonal components, if appropriate.

A STANDARDS SOCIETY FOR AUSTRALIA

The Standards Association of Australia seeks to ascertain what degree of support there would be to set up an organization comprising people with some direct interest in standards and standardization in general.

The Association feels that such a Society would be of interest to individuals who are interested in the benefits and techniques of standardization and in the application of standards, at company, association, national and international levels.

In many countries such as the United States, the United Kingdom, France and Germany, Standardizers Societies have been successfully functioning for some time. Here in Australia, SAA is prepared to provide the administrative facilities for such a body.

The initial response to this proposal has been encouraging. In order to consider this proposal further, it is proposed to organize a Conference during August 1979 in Sydney and Melbourne in the first instance to consider details of issues relating to the formation of the above Society.

Any person who is interested in participating is invited to send a brief note with his name and address to Mr. J.R. Paton, Technical Director, Standards Association of Australia, PO Box 458, North Sydney, NSW, 2060.

SECTIONAL LIST OF AUSTRALIAN STANDARDS

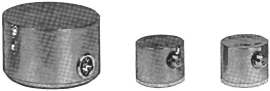
The writer gets queries by telephone frequently from members of the Australian Acoustical Society regarding availability of Acoustics Standards on different topics. An up to date list of these standards is given below:

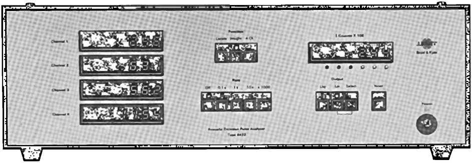
AS 1045-1971, Method of measurement of absorption coefficients in a reverberation room.

AS 1047-1971, Method of expression of the physical subjective magnitudes of sound or noise.

AS 1055-1978,	Code of practice for noise assessment in residential areas.
AS 1081-1975,	Methods of measurement of airborne noise emitted by rotating electrical machinery.
AS 1088-1971,	Methods of measurement of the electro-acoustic characteristics of air conduction hearing aids.
AS 1191-1976,	Method for laboratory measurement of airborne sound transmission loss of building partitions.
AS 1217-1972,	Methods of measurement of airborne sound emitted by machines.
AS 1259	Sound level meters
Part 1-1976	Type 1, General purpose
Part 2-1976	Type 2, Precision
Part 3-1976	Precision sound level meter for the measurement of impulsive sounds.
AS 1269-1979	Code of practice for hearing conservation.
Papers	Seminars on AS 1269
AS 1270-1976	Hearing protection devices
AS 1276-1979,	Methods for determination of sound transmission class and noise isolation class of building partitions.
AS 1469-1973,	Criteria curves for rating noise and establishing acoustic environment.
AS 1469C-1973	Noise rating curves.
AS 1591	Instrumentation for audiometry (See also Z43).
Part 4-1974	A mechanical coupler for calibration of bone vibrators used in hearing aids and audiometers.
Part 5-1974	Wide band artificial ear.
Part 6-1977	Speech and audiometers.
AS 1633-1974	Glossary of acoustic terms.
AS 1935-1976	Method for measurement of normal incidence sound absorption coefficient and specific normal acoustic impedance of acoustic materials by the tube method.
AS 1948-1976,	Method for measurement of airborne noise on board vessels.
AS 1949-1976	Method for measurement of airborne noise emitted by vessels on waterways and in ports and harbours.
AS 2012-1977,	Method for measurement of airborne noise from agricultural tractors and earthmoving machinery.
AS 2021-1977,	Code of practice for building siting and construction.
AS 2107-1977,	Ambient sound levels for areas of occupancy within buildings.
AS 2221	Methods for measurement of airborne sound emitted by compressor units including primemovers and by pneumatic tools and machines.
Part 1-1979	Engineering method for measurement of airborne sound emitted by compressor/primemover units intended for outdoor use.
Part 2-1979	Engineering method for measurement of airborne sound emitted by pneumatic tools and machines
AS 2240-1979	Measurement of sound emitted by motor vehicles.
AS 2253-1979	Methods for field measurement of airborne sound transmission in buildings.
AS 2254-1979	Recommended noise ratings for various areas of occupancy in vessels.
MP44	Guide for the use of sound measuring equipment.
Part 1-1979	Portable sound level meters.
AS Z33-1967	Preferred frequencies and band centres for acoustical measurements.
AS Z41-1969	Octave, half octave and one-third octave band pass filters intended for the analysis of sound and vibrations.
AS Z43	Instrumentation for audiometry (See also AS 1591)
Part 1-1971	Pure tone audiometers
Part 2-1970	Reference zero for the calibration of pure tone audiometers.
Part 3-1969	Reference coupler for the calibration of earphones used in audiometry.
AS Z44-1969	Expression of the power and intensity levels of sound or noise.

NEW PRODUCTS





ACOUSTIC EMISSION MEASUREMENT AND ANALYSIS SYSTEM

Minute imperfections in loaded structures and materials, which could lead to ultimate breakdown, can be detected at a very early stage of development by means of a new system introduced by Bruel & Kjaer.

When the structure, pressure vessel, material, etc. is loaded, microscopic imperfections in the stressed material result in minute bursts of energy, known as acoustic emissions. These energy bursts, which are often a result of bad welds or fatigue, are detected at frequencies of 100 kHz to 1 MHz by piezoelectric transducers fastened in close contact with the object being tested.

The B & K system consists of a choice of three transducers with corresponding amplifiers and a four channel pulse analyzer which introduces a unique pulse-area analysis technique. The analyzer also has a three dimensional AE location capability, enabling flaws to be localised, and four independent pulse counter channels. Data is presented on a digital display and can be fed to a graphical recorder or via the built-in IEC interface bus to a calculator or computer.

INFORMATION FOR CONTRIBUTORS

Items for publication in the Bulletin are of two types

(a) Shorter articles - which will appear typically under the heading 'News and Notes'

(b) Longer articles - which will appear as refereed technical articles.

The closing dates for the receipt of these articles are as follows:

Vol. 8 No. 1 Longer articles: Mid January; Shorter articles: Mid February
Vol. 8 No. 2 Longer articles: Mid May; Shorter articles: Mid June

Articles may be sent directly to the editor or via the local State Bulletin representative.

There are no particular constraints on "shorter articles" except that they should be of relevance to the Society and be received on time.

Attention to the following matters will assist when processing "longer articles".

(i) Length - typically from 3 to 4 pages when printed.

(ii) Title and Authors Address - the title should be concise and honestly indicate the content of the paper. The author's name and that of his organisation together with an adequate address should also appear for the benefit of members who may wish to discuss the work privately with the author.

(iii) Summary - The summary should be self contained and be as explicit as possible. It should indicate the principal conclusions reached. That should be possible in less than 200 words. Many more members will read the summary than will read the paper. Everybody seems to be busy these days.

(iv) Main Body of the Article - This should contain an introduction, and be followed by a series of logical events which lead finally to the conclusions or recommendations. The use of headings greatly assists the reader in following the logic of the paper. The conclusions should of course be based on the work presented and not on other material.

(v) References - Any standardised system is acceptable - for example those used by Journal of Sound and Vibration, Journal of the Acoustical Society of America, or The Institution of Engineers, Australia. Page numbers and dates are important, particularly when referencing books.

(vi) Tables and Diagrams - As a general rule, Tables are best avoided. Diagrams may need to be redrawn during the editorial stage. They ought to be totally self explanatory, complete with a title, and with axes clearly labelled and units unambiguously shown.

The papers generally will be subject to review but this is not intended to discourage members. The author no doubt would prefer to have any anomaly drawn to his attention privately rather than to gain notoriety by having errors published widely.