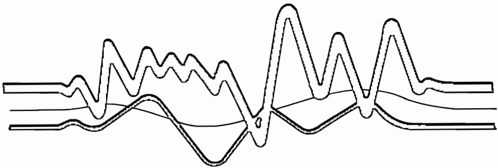
The Bulletin

OF THE AUSTRALIAN ACOUSTICAL SOCIETY

Volume 9, Number 3, December 1981



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- The Bulletin is published by The Australian Acoustical Society, 35-43 Clarence St., Sydney, NSW, 2000.

EDITORIAL

This year has been eventful for the Society. Fourteen months after the 10th ICA we have held an enjoyable, well attended and profitable Conference at Cowes, Phillip Island, Victoria. Victoria Division is to be congratulated for carrying the conference banner this year. What part 'The Lady and the Penguin' advertisement played in promoting the meeting will never be known. However, the Bulletin's circulation has not changed as a consequence of it, and Mr. Murdoch showed no interest in taking us over, so we shall remain with the Society for the time being.

Next year the Bulletin will be produced by NSW Division. Since this may well be the last blood-red issue distributed, it is interesting to reflect that the most shocking thing about the Victorian produced Bulletin was its cover. Victoria's current Bulletin Committee met for the first time at Monash University on 11th October, 1978. At that meeting nobody wanted to be Editor, nobody knew anything about publishing or printing and everybody wanted to step down as soon as possible. The minutes show agreement that: 'An offer should be made to take over the Bulletin for a period of three years ....'; 'The offer should state that the number of issues will be reduced from four to three per Volume ...'; and, 'the Committee would welcome an advance of $1000 ...'. Thus, from the outset, Victoria's commitment was to be of finite duration and reduced magnitude, and money was needed to get things moving.

Those present at the first meeting were Robin Alfredson (editor 1979), John Davy (proof reader and sub-editor 1979-81), Don Gibson (the same), Graeme Harding (business manager and gossip columnist 1979-81), Eric Koop (distribution manager 1979-81) and Rob Law (advertising manager 1979, editor 1980-81). Robin Alfredson stood down at the end of 1979 and John Lambert (advertising manager 1980-81) took his place. The Committee's editorial policy never varied: The Bulletin would be distributed on time, it would pay for itself and it would publish anything relevant to Society members. The Victorian Committee never saw the Bulletin as a Learned Society Journal.

Three years after that first meeting, it is clear that our committee's most sensible act was to limit the duration of our commitment: Even at our most apathetic moments we were prepared to meet deadlines and make sure that every issue appeared on time because the end was always in sight. Now that the end is here, we no longer have to chase people for copy and advertisements and address lists, and we no longer have to write provocative articles or letters to the editor in the hope of stimulating some argument or debate. We willingly transfer all those problems to Howard Pollard and his NSW Editorial Board. In doing so, we wish NSW Division success and good fortune with The Bulletin.

In the past three years many people have helped us to produce the Bulletin. We shall name three who are not members of the society; Jacinta Andrews, Roslyn Brown and Bernie Wilson. To them we say a special thank you. To our advertisers, contributors and readers we say hail and farewell.

We wish you all a Merry Christmas and a Prosperous New Year.

FROM THE PRESIDENT

I am pleased to write a few words as incoming President in this particular issue of the Bulletin - the last to be produced so capably by the Victoria Division (for a few years, at any rate!). I have great expectations that the NSW Division's production team, under the direction of our new Editor-in-Chief, Howard Pollard, will continue the good work of achieving the high standards that Victoria has set.

I would like to pay tribute to Ray Piesse who has just stepped down from the President's role after two very important years which saw the AAS placed firmly on the international acoustic map through its organisation of the 10th ICA. Duncan Gray, also, has finally insisted that his days as General Secretary are over and our sincere thanks go to him for his efforts on behalf of the Society.

As one of the first Councillors of the incorporated Society, and, indeed, as a member of the steering committee which agonised at great length over the Memorandum and Articles of Association, I have been exceedingly pleased at AAS' survival and growth and at its relative lack of fossilisation (although perhaps this latter point might be debated by some of our younger members).

Recent events in the Society, however, have prompted me to think that it has reached one of those stages which occur in the lives of Societies and men, where it is necessary to look around and take stock:- to reflect on our past achievements and failures, on our present situation and on our future direction. I have always seen the Society as having a place for people with diverse interests, talents and aspirations, catered for by our distinct grades of membership. At one end of the spectrum there are those for whom acoustics is an interest, and at the other those for whom acoustics is a profession.

Unfortunately, it is clear that we now have a great division in our Society - between those members who consider themselves "acousticians" and the organisation as one representing the profession of acoustics, and those members (of whatever Grade) who see it simply as a learned society, or club. I will be interested to hear all your views on this, because they will surely dictate the direction that the AAS will take over the next few years.

Anita Lawrence
President

NEWS & NOTES

1981 AAS CONFERENCE

COWES, PHILLIP ISLAND

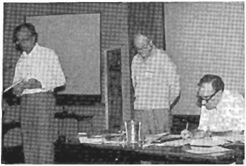
Phew!! It's all over for 1981 and we are all immensely pleased and relieved -pleased that we can return to normal and relieved that by all accounts the conference was a hugh success. If you missed the conference you missed a milestone in the history of our Society.

The twenty-eight contributed technical papers showed the high level of activity in acoustics throughout Australia. Our invited guest speakers, Professor Brian Johnstone and Dr. Tom Stubbs, presented notable papers which highlighted the technical programme.

It was pleasing to see the conference, centred on a small island in southern Victoria, so well supported. Delegates headed off from many corners of Australia (and one from New Zealand) arriving by plane, bus, car and foot. Sunny Victoria welcomed visitors and even the Victorians were amazed with the ideal weather conditions. This contributed to a relaxed atmosphere and a very congenial gathering.

The biggest disappointment was the need to acquire accommodation in five separated motels. Due to factors beyond our control it was not possible to confine all delegates within the bounds of the Continental Resort Centre and its immediate neighbour. However, the Continental management did their utmost to assist the conference organisers cater for the needs of the 140 attendees.

Many members should be thanked for their role in the successful running of the conference. All contributors to the technical sessions are thanked for their high standard of aural and written presentation. Sustaining Members who displayed their products are also thanked for their efforts. But above all, the Society thanks the conference organisers Messrs. Duncan Gray (Convenor), Geoff Barnes (Registrar), Jim Kirkhope (Transport and Social Co-ordinator) and Ken Cook (International Traveller) for an enormous task well done. May we take this opportunity to advise the acoustic fraternity that spare copies of the Proceedings are available from the Secretary, Victoria Division, Australian Acoustical Society, 191 Royal Parade, Parkville 3052 at a cost of $20.00 per copy (including postage).



THE INFLUENCE OF TRAFFIC NOISE ON ENVIRONMENTAL PERCEPTION

R.P. Williamson, M.A.A.S.,

Aims

To study the influence of traffic noise in a residential area, by examining three objectives. First, to compare the effect of traffic noise on environmental perception in a noisy area, with that of a quiet area. Second, to study the noise generated by discontinuous traffic, as a result of acceleration or deceleration, by comparing it with the noise emitted by the same traffic moving at a steady speed. Third, to review a number of methods suitable for the prediction and control of road traffic noise intrusion in residential areas. These objectives formed the major part of a thesis for the Bachelor of Architecture degree.

Report

From a number of sites suitable for the study of environmental perception, two survey samples--one in a quiet area and the other in a noise area --were statistically selected in Unley. By using an extensive questionnaire, environmental perception differences were evaluated with the aid of a computer package (S.P.S.S.). The two survey samples were found to have similar demographic and physical appearance characteristics as well as being representative of the Adelaide Statistical Division. The results indicated that not only did traffic noise substantially contribute to a different perception of residential satisfaction in the noisy area, but also that the majority of residents in this area were annoyed by traffic noise and wanted to move from the noisy streets at some time in the future. The results also indicated those features which most influenced people's perception of the environment, as well as the reasons they had for coming to the area, for staying or for moving from it at some time.

The investigation of interrupted traffic noise was carried out with assistance from the Noise Control Unit of the S.A. Department for the Environment. The results, of studies of noise levels from 10 sites, showed conclusively that more noise is produced by discontinuous traffic than when it is flowing steadily and that this is confined to a low frequency range (25 Hz - 630 Hz). Furthermore, not only were peak noise levels (L10) increased by 2-3 dB but there was also a rise in ambient noise levels (L90). There was some evidence that a relationship exists between the excess noise produced by discontinuous traffic and the peak flow rate of one way traffic. The proportion of non-domestic vehicles, in the traffic composition, appeared to have no influence on the excess noise.

Of the methods available for predicting road traffic noise most incorporate parameters including traffic flow rate, percentage of non-domestic vehicles, road gradient and distance from noise source. Very few incorporate corrections for discontinuous traffic. In general, the most effective solutions for controlling traffic noise include road barriers, screening of dwellings by suitable walls or buildings and adequate separation of the source from dwellings.

SWIMMING POOL PUMP NOISE PROBLEM A CASE HISTORY

The complaint arose from the noise of a swimming pool pump in a well established residential suburb consisting of a mixture of high class residences and home units. The pump was located close to a dividing fence made of brush wood, and about 4 metres from the kitchen windows of a home unit occupied by an elderly couple, both of whom enjoyed indifferent health. They complained of a low pitched hum from the pump, which was most noticeable in the kitchen, and also intruded into adjacent living rooms.

The Noise Control Section of the Department for the Environment investigated the problem and determined that an 8 dBA reduction was required. The offending hum was ascertained as being mainly in the 125 Hz Band.

Examination showed the integral pump and motor to be bolted solidly on to a 19 mm baseboard, sitting loosely on two 100 50mm hardwood bearers on the ground. Surrounding the unit was a close enclosure made of 19 mm asbestos cement board resting loosely on the base board. It had a removable lid for servicing access. A rectangular opening at each end provided for cooling air and water pipes respectively.

Noise control measures included the provision of a concrete base 300 mm thick imbedded in the ground, and the pump and motor were mounted on rubber anti-vibration mounts. The enclosure was lined with 38 mm fibreglass sound absorption material of 50 Kg/m^3 density.

The result was a 12 dBA noise reduction and two very relieved people in the home unit.

After 6 weeks of bliss the annoying noise suddenly began again. Investigation in their kitchen with a tunable band pass filter established that its source was probably from electrical excitation as the noise was precisely 100 Hz. As the owner of the pool was away it was not possible to inspect the pump for a week or so. When this was done it was discovered that the pump service mechanic had inadvertently moved the enclosure so that it was bearing solidly against the pump and motor. Once it was freed the offending noise ceased.

H. Dean

GOSSIP

Well, you've got to admit it, Victoria did put on a good Conference. These live-in conferences certainly serve as an excellent venue where members can get together, renew acquaintances, talk over problems, and similar. And, the papers were good! As one person put it the papers at the Cowes Conference were, on the whole, better than the average of the papers at an I.C.A. which are on the average better than the papers at an Inter-Noise Conference.

Inevitably the nostalgia discussions centred around previous Conferences, particularly the Warburton Conference, the Medlow Bath and Hotel Flordia Conferences. Of course these other live-in Conferences were a long time ago; but how long few of us could remember. Here to refresh your memories is a complete list of Conferences held by the A.A.S.

INTERNATIONAL ACOUSTICS SYMPOSIUM organised by the N.S.W. Division at the Wentworth Hotel, Sydney, 1968, September 9 and 10.

NOISE REDUCTION OF FLOORS, WALLS, AND CEILINGS organised by the N.S.W. Division at the Hotel Florida, Terrigal, 1969, October 11 and 12.

NOISE ZONING organised by the Victoria Division at the Warburton Chalet, 1971, March 6 and 8.

NOISE LEGISLATION AND REGULATION organised by the N.S.W. Division at the Hotel Florida, Terrigal, 1972, September 30 to October 2.

CURRENT ACOUSTICS - SEMINAR organised by the N.S.W. Division at the North Sydney Club, 1974, September 20.

PLANNING FOR NOISE organised by the N.S.W. Division at the Hydro-Majestic Hotel, Blue Mountains, 1975, September 19 to 21.

PROGRESS IN ACOUSTICS organised by the Victoria Division at the National Science Centre, Melbourne 1976, September 17 and 18.

SYMPOSIUM ON NOISE AND VIBRATION IN INDUSTRY organised jointly by the W.A. Division and the Institution of Engineers Australia, W.A. Institute of Technology, 1977, August 29 and 30.

OCCUPATION HEARING LOSS - CONSERVATION AND COMPENSATION organised by the N.S.W Division at Sydney University, 1978, September 1 to 3.

10TH ICA organised by the 10th ICA Organising Committee predominantly composed of New South Welshmen at the University of N.S.W., 1980, July 9 to 16.

ACOUSTICS AND SOCIETY organised by the Victoria Division at the Continental Hotel and Conference Centre, Cowes, 1981, September 17 to 19.

Those who attended the Annual General Meeting could be excused for thinking that Annual General Meetings have become long and lively affairs. All in all the outcome of all the voting wasn't very surprising at least to me, your gossip columnist.

Many Societies do not have a code of ethics; but how many would actually vote not to have a code of ethics. This almost sounds unethical to me.

In previous Gossip Columns I've mentioned the current state of the CSIRO as a result of the Razor Gang. The current situation as I understand it is that the Division of Mechanical Engineering has been re-constituted as the Division of Energy Technology, with Dr. Don Gibson M.A.A.S. as acting Chief of the Division.

The situation with respect to the Division of Building Research is that it is currently under review. By the time you read this the outcome of the review should be known.

And what is happening about the E.B.S. says the reader? The answer is that your gossip columnist doesn't know.

I have been keeping readers informed of publications by members of the Society in various overseas journals. I won't list them all this month but readers will have noticed articles in the J.A.S.A., Sound and Vibration, Applied Acoustics, Noise Control Engineering, and other journals since the last issue of the Bulletin.

Having made pleas to members to submit gossip information to me you will be pleased to know that I can report that Len Koss submitted a long summary of some of the work that he is doing at Monash University.

In the past I have also mentioned the overseas jaunts made by members of the Society. Lest you think these jaunts are all beer and skittles I reproduce below notes provided to me by Ken Cook when he and his wife Bev went to Europe recently.

From the beginning of September Ken Cook of Melbourne paid a five-week visit to Europe. He made brief calls to Prof. H. Myncke of the Catholic University (Leuven, Belgium), to C.S.T.C. building research station (Limelette, Belgium), to H. Jonasson of the National Testing Institute (Boras, Sweden), to Prof. S. Lindblad of Lund University (Lund, Sweden), to Dr. W. Ruchward of Bundesanstalt fur Materialprufing (Berlin), and to Prof. M. Heckl of the Technical University of Berlin.

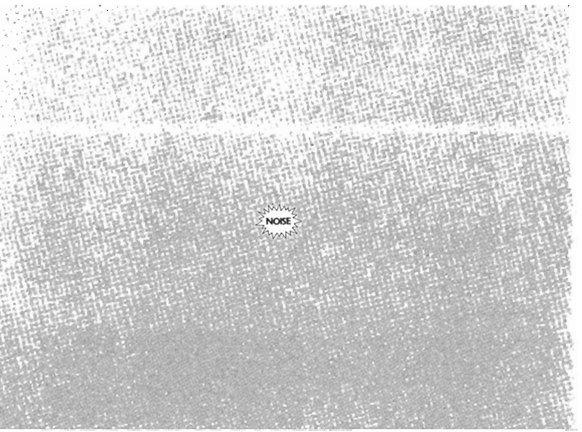
He was also able to attend the conference at Senlis (France) on 'Recent Developments in Acoustic Intensity Measurement', attended by 220 delegates. The conference was also attended by Fred Zockel of University of Adelaide, Leigh Kenna of National Acoustics Laboratories, Sydney, S. Hall of N.S.W. Institute of Technology and W. Renew of Division of Noise Abatement, Brisbane.

Ken attended the 'Inter-Noise 81' conference at Amsterdam, at which he presented his paper, 'Public Telephone Cabinets: Acoustic Properties'. Leigh Kenna also presented his paper, 'Impulse Noise Measurement Systems'. Some 640 delegates attended from more than 30 contries (a record) with 250 papers being offered. From Australia, other delegates attending were B. Gibson-Wilde of Townsville, W. Renew, Bob Williamson from Adelaide, and Fred Zockel. At the conference conclusion Ken represented A.A.S. at the General Assembly of the International Institute of Noise Control Engineering, of which A.A.S. is a member.

This being our last gossip column, mention must be made of the debt owed by all members of the society to the advertisers who have supported the Victoria Division Publication Committee. The Bulletin is vitally dependant upon advertisers, and unless they receive feedback from members of the Society they will quite rightly regard advertising in the Bulletin as a charity rather than as a financially worthwhile exercise. So that if you are talking to any representatives of any of our advertisers let them know that you appreciate their advertisement even if you aren't buying their goods.

What of the future? We understand the New South Wales Division will not run a gossip column, but that may not mean that we cannot provide them with an occasional column. Thank you, all those who provided me with information, and complimentary remarks of encouragement.

Graeme E. Harding


NOISE

Prediction of Low-Frequency Traffic Noise for Building Vibration Studies

G.H. HOLLINGWORTH

Highway Planning Branch,
Main Roads Department, Queensland.

Vibrations induced in buildings by road traffic have been the subject of research in the U.K. for a number of years. Recent attention has focussed on the large contribution which low-frequency traffic noise levels commonly make to these vibrations. Moreover, it has recently been shown that building structures can be calibrated in terms of their internal vibratory response to external low-frequency noise. However to date, there has been no precise method available for predicting external one-third octave band low-frequency traffic noise levels for use in building vibration studies.

This paper describes a study into the prediction of low-frequency traffic noise, some of the results of which have been used to develope such a prediction method. The equations developed are tested against measured levels from a variety of authors and shown to be accurate. One-third octave band levels are shown to be less predictable than broader-band vibratory disturbance scales. The prediction method is also evaluated against an approximate interim method used by one overseas authority to date. It is shown that large prediction errors can arise with this interim method, especially if different heavy vehicle categories are not accounted for.

INTRODUCTION

Background

Vibrations induced in buildings by road traffic can be transmitted from source either by ground or by air. Though the subject of much early work (eg. 1,2), ground-borne vibrations have recently been discounted as an important vibration generator under most circumstances, except in the case of badly corrugated roadway surfaces and small house-roadway separations (3,4,5,6). Conversely air-borne vibration (in the form of low-frequency traffic noise) has come to be seen as a highly significant contributor to vibrations induced in buildings (6).

Recent work has shown that buildings and residences can be calibrated to enable prediction of internal vibration levels from external facade low-frequency noise levels. Figure 1 shows data presented by Hill (7) based on work performed on 14 semi-detached London residences, as part of a social survey by the Transport and Road Research Laboratory into vibration disturbance. Variations in room dimensions, window sizes and other factors cause each house to have a unique vibratory response to external low-frequency levels. This must be ascertained before vibration changes due to changed traffic (and thus low-frequency noise level) conditions can be predicted. Similar calibration work has recently been performed on architecturally sensitive structures (8).

Moreover, this latter study has underlined the urgent need for a suitable low-frequency traffic noise prediction method, since changed external levels could only be predicted in that study from the technically inappropriate method presented in (9). Thus the following paper describes a study into the prediction of low-frequency traffic noise levels, the results of which can be used in building vibration studies. The general philosophy of the main study was to measure low-frequency noise and traffic parameters at a number of specially selected sites. These sites would be chosen on acoustical grounds to minimise intersite variations in measured levels, which might result from differences in site propagation, absorption, diffraction or reflection characteristics. Thereafter low frequency noise scales would be related to traffic variables alone. Extensions to the prediction model developed, to cater for more variable site conditions, would be developed at a later time.

PLANNING THE SURVEYS

The Problem of which Variables to Survey

The first problem to be overcome was the choice of a suitable measurement scale for the one-third octave frequency bands. Leq was finally chosen after detailed deliberations documented in (10). The range of frequencies covered extended from 5 Hz to 1000 Hz, though only 4 of the one-third octaves over this range are of relevance to this paper (based on the 50, 63, 80, 100 Hz onethird octaves used in vibration studies to date (7), (8)). The next was the choice of traffic parameters for the study. After consideration of a number of variables (such as total flow, composition, mean speed, level of service, rate of arrival, location of lorry exhausts etc.) and

resource constraints, it was decided to measure only flow, composition and % of commercial vehicles not in top gear (this latter parameter being determined aurally).

A review of the literature on composition variables (see (II) for desirable composition stratification where L_{10} dB(A) levels are of interest), together with a re-analysis of data presented in (12), encouraged the adoption of the following tentative classification -

(a) Motor bikes (all types)

(b) Cars (all types)

(c) Light Commercial Vehicles (car based vans and/or two axle C.V.'s with unladen vehicle wt. < 3000 kg)

(d) Medium Commercial Vehciles (C.V.'s with 2 axles and unladen wt. > 3000 kg, including buses and coaches)

(e) Heavy Commercial Vehicles (all C.V.'s where number axles > 3)

There was little requirement for the measurement of numerous site characteristics because the study was fundamentally concerned with determining how variations in traffic parameters affect levels of low-frequency traffic noise at a reasonably uniform set of sites. Once a site was found to satisfy a check-list of 10 acoustic related criteria, a set of only 7 geometric layout parameters were measured and recorded for each site. All measurements were made under the following conditions -

(a) dry road conditions

(b) low wind (force 0 or 1 on the Beaufort scale)

(c) clear or patchy skies, but with no thunderstorms approaching (a reported natural source of low-frequency noise (14)).

The Problem of Where to Survey

A large number of factors can contribute to inter-site acoustical differences in a study such as this. These differences, arising from variations in facade reflections, uniformity of intervening ground cover and shielding effects, can have an important bearing on the lack of statistical independence of large amounts of data taken at only a few sites. This has been pointed out in (15), and has encouraged more recent Australian prediction-verification studies to collect data, wherever possible, under conditions of "one measurement sample per site". Although some of the mechanisms leading to inter-site differences in L_{10} dB(A) levels are probably of less significance to low frequency noise propagation, there were other factors (such as the possiblity of unwanted low-frequency levels emanating from building ventilation systems onto the streets) which encouraged the same need for many sites and the same restrictions on number of measurement samples per site to be applied in this study. Such a philosophy was applied throughout this current study and only one measurement per site was taken.

The selection of roads was based on the need to cover adequately a useful range of traffic flows (by vehicle class), without incurring increased site variability at higher flow rates. The actual flow ranges achieved are detailed in (10). Thereafter, 32 general site areas were chosen along these London roads, 5 of which were on grade.

The microphone position at each site area was determined after consideration of a number of conflicting requirements, but was usually chosen according to the following criteria -

(a) microphone height - 1.2 m above road crown, or 1.2 m plus height of garden wall (but never less than 1.2 m).

(b) microphone offset - 1.0 m from the nearside facade wherever possible.

The actual list of heights and offsets achieved are detailed in (10).

Equipment-noise tests, which are reported in detail in (10), showed the chosen data gathering system to be a high quality noise measurement, recording and analysis system. Full details of all measurement and analysis procedures are given in (10).

ANALYSIS OF DATA

Verifying Data Accuracy

Previous preliminary analyses (10) have shown that the measurement data are accurate. Low-frequency noise scales were compared with data from various sources and found to be of the correct order of magnitude. Further, a method developed for the prediction of a general residential vibration disturbance metric - Leq (40-125 Hz) - later showed (10) that other authors' data of this type could be predicted to an accuracy of 0.9 dB (mean prediction error, with standard deviation of 2.27 dB), thus further testifying to the accuracy of the low-frequency measurement data.

Analysis of Measurement Data

The aim of this part of the study was to produce a set of equations and supplementary gradient corrections for the prediction of four low-frequency scales: - Leq (50 Hz), Leq (63 Hz), Leq (80 Hz), Leq (100 Hz). Initially, simple bivariate regression analysis was used to test whether traffic variables had indeed greater explanatory power of variations in measurement data over that of site layout

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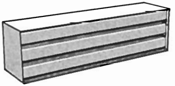

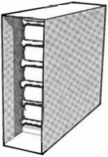

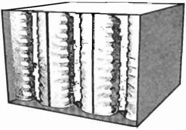

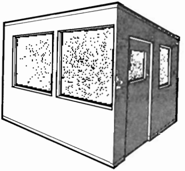

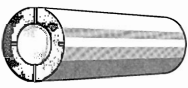

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TABLE 1

SUMMARY OF PREDICTION EQUATIONS FOR ONE-THIRD OCTAVE Leq LEVELS

(i.e. Best Practical Equations)

	Co-efficient of Determination	Standard Error of Estimate	Regression Significant
(1) Leq (50 Hz) = 40.9 + 11.8 log (Q_T) - 0.54 log (PLCV) + 3.2 log (PMCV) + 1.6 log (PHCV)	76.0%	2.24 dB	Yes - 1% lev
(2) Leq (63 Hz) = 48.44 + 9.3 log $(Q_T + 10 \times Q_{MCV} + 40 \times Q_{HCV})$	83.7%	1.64 dB	Yes - 1% lev
(3) Leq (80 Hz) = 54.5 + 6.2 log Q_T + 0.12 (PLCV) + 0.1 (PMCV) + 1.05 (PHCV)	82.7%	2.07 dB	Yes - 1% lev
(4) Leq (100 Hz)= 40.3 + 9.66 log Q_T + 0.036 (PLCV) + 0.15 (PMCV) + 0.68 (PHCV)	80.3%	2.13 dB	Yes - 1% lev

Legend:

Q_T = total hourly flow in v.p.h.;

PLCV = % of light - commercial vehicles;
PMCV = % of medium - commercial vehicles;
PHCV = % of heavy - commercial vehicles;
PERNTG = % of commercial vehicles not in top gear;
QMCV = hourly flow of medium - commercial vehicles;
QHCV = hourly flow of heavy - commercial vehicles.

variables, and to find which traffic variables were best suited as seminal variables for later multiple regression analysis.

Regarding the former investigation, testing of the significance of diferences between Pearson Product-Moment Correlation Co-efficients for traffic variables vis-a-vis site layout variables, was accomplished by means of a statistical test for non-independent data (see (13), page 53).

In all four cases, it was found that the worst* explanatory traffic variable had a significantly different and improved Correlation Co-efficient over that of the best explanatory layout variable (results were significant at the 1% level - $p < 0.01$ - for Leq (50 Hz), Leq (63 Hz), Leq (80 Hz), and at the 5% level - $p < 0.05$ - for Leq (100 Hz). Thus it was shown that site to site variations in measured low-frequency traffic noise levels were arising mostly from variations in traffic conditions.

In relation to the second part of the bivariate regression analysis, each one-third octave Leq level was found to have a unique and optimum traffic correlator which maximised the Co-efficient of Determination (except that the 80 Hz and 100 Hz results were the same). These variables were later used as starting points in Multiple Regression Analysis. Further, each of these optional bivariate regressions were plotted out on SPSS** scattergrams to check -

(a) the form of the relationship

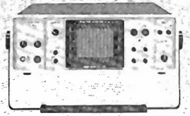
(b) whether any erroneous outliers existed

(c) what further variables explained the juxtaposition of data.

Multiple Regression Analysis was then commenced for each one-third octave. A procedure similar to that adopted in (10) was used. Again, it was found that the percentage of non-top-gearing commercial vehicles assumed importance as a supplementary explanatory variable, enabling Standard Errors of Estimate to be meaningfully reduced. This phenomenon has similarly lead to two sets of prediction equations (only one however - the "practical" set of predictions - is presented here). The equations developed are shown in Table 1.

* Based on that variable which had the lowest Co-efficient of Determination.

** S.P.S.S. is an acronym for Statistical Package for the Social Sciences, a suite of computer programs for same.



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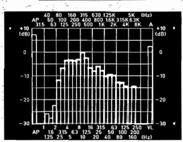

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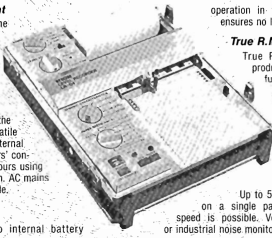

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TABLE 2

CORRECTIONS FOR GRADE

dB Values to be added to results of Prediction Eqns

Grade Range	Leq (50 Hz)	Leq (63 Hz)	Leq (80 Hz)	Leq (100 Hz)
0 - 3%	0	0.67 x Grade	0	0.9 x Grade
3 - 6%	+ 3.7	+ 3.4	+ 3.37	+ 4.93

TABLE 3

Verification of Study's Leq (100 Hz) Prediction Method (which includes Gradient Corrections)

Measurement Reference	Source of Data*	Compliance with Site Constraints	Measured* Leq (100 Hz)	Predicted Leq (100 Hz)	Error (P-Meas) dB
(1) Ludlow (10% grade)	after Martin 1978	Yes - except height of mic	75.2	78.5	+ 3.3
(2) Lewes (4% grade)	after Martin 1978	ditto	78.0	77.1	- 0.9
(3) Guildford	after Martin 1978	No - but an adjustment made therefore	77.9	75.5	- 2.4
(4) Slough Road Uxbridge	after Martin, Nelson and Hill 1978	Yes	73.0	70.8	- 2.22
(5) Ditto 5.2	Ditto	Ditto	76.0	70.8	-
(6) Warsaw	After Miazga and Janicka 1979	Corrections made	69.5	65.44	- 4.06

Error Population mean ($\bar{x}$) = - 1.91 Error Population s = 2.96

Further, to develop corrections for road gradient, these equations were used to predict uncorrected one-third octave levels at 4 gradient sites. The difference between measured and predicted values at these sites were used to construct the corrections for gradient shown in Table 2. Due to this small number of sites, however, only rough guides could be developed.

VERIFICATION OF PREDICTION METHOD

The prediction equations and corrections have been tested against measured data from other authors. An example of such comparisons is given in Table 3, for Leq (100 Hz). Prediction errors* for other frequency bands were -

Leq (50 Hz) : $\bar{x}$ = + 2.45 dB S = 2.88 dB
Leq (63 Hz) : $\bar{x}$ = + 2.29 dB S = 2.91 dB
Leq (80 Hz) : $\bar{x}$ = + 0.52 dB S = 4.69 dB

These results are considered satisfactory, though the predictions are less accurate for single one-third octaves than for parameters made up from a combination of octaves (10). This result is not entirely unexpected.

SENSITIVITY ANALYSIS

Finally, a small sensitivity analysis was carried out to show under what circumstances, use of the approximate method of (9) for one-third octave band prediction (as used in (8)) would be grossly in error.

It was found that for changes in traffic conditions, predicted changes to octave band levels resulting thereby were similarly predicted by both methods (diferences ranged from 0.4 - 1.6 dB over the range 500 - 5000 vph, with maximum changes of % heavy vehicles ** from 20% to 0%). However, differences between the two methods could rise to as much as 8 dB where changes occurred within the heavy vehicle category but such as to keep the overall % of heavy vehicles ** relatively constant. The effect appears to become worse at higher frequency levels. The method outlined herein is therefore recommended for adoption to cater for as many traffic-change circumstances as possible.

CONCLUSIONS

A method of predicting low-frequency one-third octave band traffic noise levels from traffic parameters (under controlled site conditions) has been described.

The method's usefulness can be extended to include other types of sites where changes to low-frequency levels (resulting from changed traffic flows or compositions) are to be predicted. Such predictions will assist in predicting changes to the internal building vibrations generated by road traffic.

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ACKNOWLEDGEMENTS

The author would like to acknowledge the assistance given him during the study by Messrs Crompton, Gilbert and Hanson of the College and Messrs Blackaller and Vulkan of the Greater London Council. Any opinions expressed are those of the author.

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* Prediction errors are quoted to decimal places to aid interpretation, rather than rounding to the nearest dB for acoustical realism.

** Assuming the heavy vehicle definition in (9).

Predicting and Specifying the Attenuation of Acoustically Lined Ducts for Air Conditioning Systems

by M.D. Mason, and T.D. Hamilton,
Association for Computer Aided Design Ltd.
(ACADS).

In this article current methods of predicting and specifying the attenuation of acoustically lined ducts for air conditioning systems are discussed. A prediction method proposed by Dr. Istvan L. Ver from Bolt Beranek & Newman Inc., Cambridge, Massachusetts is reviewed and some modifications made to this method by the authors to improve the correlation with available data from Australian manufacturers is described.

The attenuation of sound in ducts with internal lining has been the subject of extensive theoretical and experimental investigations. Lined duct attenuation has been found to be dependent on the duct length, the cross sectional dimensions, the thickness and type of lining material and the wavelength of the sound propagating along the duct. Unfortunately the mathematical calculations involved in evaluating attenuation theoretically, are far too complex and tedious for the practicing air conditioning systems designer.

Experimentally derived data for selected ranges of duct geometry have been published over the years and a limited amount of tabulated data in the form of design guides is also available. Most of this data however is based on ducts lined on two sides only and for duct dimensions wherein the lining thickness is comparable with the duct dimensions. This information is of value when designing duct silencers but is of limited value when designing ductwork systems. It does not provide for the configuration of ducts or lining thicknesses encountered in heating, ventilating and air conditioning systems. The lining thickness in these systems is usually quite small compared to the duct dimensions. In most instances the data is quoted for only one material type and the material acoustic properties are quoted in terms of the absorption coefficient. In the close confines of a duct, the absorption coefficient is a very poor indicator of the attenuation except at low frequency in small ducts. The measured absorption coefficient for most materials is either a random incidence coefficient, measured in a reverberant room, or a normal incidence coefficient measured in an impedance tube. In ducts the sound impinges on the lining at glancing incidence. It has been shown that flow resistance is a far better indicator of the acoustical properties of duct linings and this in turn is related to the bulk density of the lining material.

In specifying duct lining materials in contract specifications, designers, because of the lack of other readily available design criteria, generally resort to specifying the absorption coefficient as the major or even the only performance criteria. When the density is specified it is usually on the basis of a range within which the offered material must lie. This range is generally very wide and this results in a wide range of materials that comply with the specification and these can give very different values of attenuation.

A recent survey of available data and prediction methods was reported by Dr. Istvan L. Ver (1) and in his paper a prediction method for evaluating the insertion loss of rectangular ducts lined on four sides is proposed. The method is based on a well documented database and allows for lining materials with bulk densities in the range 24 to 48 kg/m^3 and for lining thicknesses of 12.5, 25 and 50 mm. Unfortunately this still does not cover completely the commercially available range, which includes materials with densities up to around 96 kg/m^3. Predictions using the method, also do not match some of the more recently published Australian manufacturer's data.

In brief the method is based on the evaluation of a base insertion loss spectrum which is multiplied by the duct perimeter over area ratio. The values of the base insertion loss at each frequency are dependent on the duct cut-off frequency f_c determined from -

$$f_c = 1000.c/d \qquad (1)$$

where -

f_c = cut off frequency (Hz)

c = speed of sound in air (343 m/s)

d = smallest duct clear airway dimension (mm)

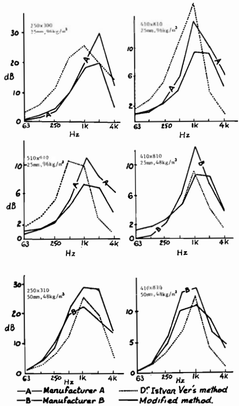

FIG. 1 Various plots of attenuation/metre versus frequency comparing prediction methods with currently available manufacturers data in Australia. (Duct dimensions are clear internal).

Below this cut-off frequency the base insertion loss is evaluated from a chart of log (insertion loss) versus log (frequency) on which various lining thicknesses and densities are plotted as straight line relationships. For a particular thickness and density the base insertion loss is doubled for each doubling of frequency.

Above the cut-off frequency the base insertion loss falls away with frequency in accordance with the relationship -

$$IL_B = 3(f_c/f)^2 \qquad (2)$$

with an upper limit of 3dB

where

IL_B = the base insertion loss (dB/m)

f_c = the cut-off frequency from eqn 1(Hz)

f = octave band centre frequency being considered (Hz).

When plotted against the limited amount of available data from Australian manufacturers, the method seems to agree reasonably well for low density materials but at higher densities the insertion loss is over predicted at low frequencies whilst at high frequencies the insertion loss seems to decrease too rapidly. The fact that the method predicts a significant increase in insertion loss for higher densities in the low frequency range was of particular concern to the authors as this did not agree with the findings of others. In most of the theoretical work published the density (or flow resistance) only affects the insertion loss at high frequencies.

Some modifications were made to the prediction method and this resulted in much better agreement with the available published data and allowed the method to be extended to cover much high density lining materials. Comparisons with data from two Australian manufacturers are illustrated in Fig. 1 and comparisons with some information published by Challis and Lawrence (2) are illustrated in Fig. 2.

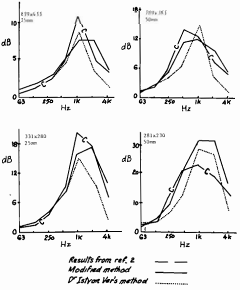

FIG. 2 Various plots of attenuation/metre versus frequency comparing prediction methods with published data by Challis and Lawrence (2). (Duct dimensions are clear internal).

The main modifications made to the prediction method were -

(i) The base insertion loss below cut-off frequency is assumed to vary with thickness only and to be independent of density (refer Fig. 3.)

(ii) The slope of the 50 mm lining thickness line on the base insertion loss chart was changed to give a greater rate of increase with each doubling of frequency (refer Fig. 3.)

(iii) The exponent in equation 2 was replaced with an exponent dependent on density. This in effect reduced the rate of fall-off in insertion loss at high frequencies for the higher density materials.

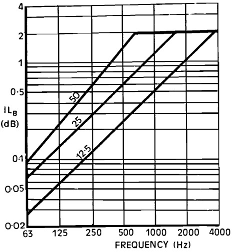

FIG. 3 Base Insertion Loss for frequencies below cut-off frequency.

The following is a description of the modified prediction method which enables predictions to be made for duct lining materials up to 96 kg/m³ and higher. The predictions agree well with the limited amount of currently available published data although comparisons with more extensive experimental data when available should be undertaken. The method is as follows:

STEP 1 Determine the cut-off frequency from equation 1.

STEP 2 Determine the base insertion loss IL_B as follows -

(i) for frequencies below the cut-off frequency extract the value of IL_B from Fig. 3 for the particular thickness of lining material.

(ii) for frequencies above the cut-off frequency -

$$IL_B = 3(f_c/f)^n \qquad (3)$$

with an upper limit of 2dB/metre

where -

IL_B = base insertion loss/metre (dB/m)

f_c = the cut-off frequency (Hz)

f = the octave band centre frequency being considered (Hz)

$$n = 2^{[\log_{10}(96/\rho)/\log_{10}4]} \qquad (4)$$

ρ = the bulk density of the lining material (kg/m³)

STEP 3 Multiply the values obtained from STEP 2 by the ratio of the duct perimeter P(m) to the duct cross sectional area A(m²).

STEP 4 Entrance loss - If the upstream duct segment has no duct lining and the lining protrudes into the air stream add 5 dB to all frequencies above twice the cut-off frequency f.

STEP 5 Flow correction -

(a) When the sound propagates against the flow or if the duct velocity is less than 10 m/s there is no correction for flow.

(b) For velocities above 10 m/s and when the sound propagates with the flow, the insertion loss figures are multiplied by 0.9 at each frequency where the base value determined in STEP 2 exceeds 1 dB.

STEP 6 The total attenuation in the straight length of duct is then -

$$A = (IL_B + A_B) \times 1 \qquad (5)$$

where

A = total duct attenuation (dB)

IL_B = duct insertion loss (dB/m) determinated from Steps 1 to 5

A_B = attenuation of equivalent bare duct (dB/m)

1 = the length of the straight duct (m).

Large values of calculated attenuation should be treated with caution as flanking

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through the duct walls and self generated noise, even in low velocity systems, will impose an upper limit on the amount of attenuation that can be achieved. In practice values of attenuation greater than 40 dB should not be used.

The above method of calculation is based on data for rectangular ducts. The amount of data for circular ducts is far less than for rectangular ducts, and no similar prediction method is available.

Because of the number and range of variables involved, the tabulation of attenuation data based on this method is quite voluminous. A computer program (LION) to evaluate the attenuation of a selected range of duct sizes for a nominated lining material thickness and bulk density has therefore been developed by ACADS the Association of Computer Aided Design. The prediction method has also been incorporated in the Department of Housing and Construction's Air Conditioning Duct Design computer program 'DONKEY' which performs a complete acoustical analysis of air conditioning ductwork systems.

With the new method, not only will designers be able to better predict the performance of acoustically lined air conditioning ducts, but they will also be able to specify more precisely the physical properties required to achieve the design performance. If more experimental data is made available to further verify the prediction method it will be possible to make further refinements and perhaps eventually incorporate means of predicting the affects of different surface finishes.

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VICTORIA DIVISION REPORT

Since the last Bulletin the Victoria Division has hosted the Annual Conference at Cowes, Phillip Island. As the Conference is discussed elsewhere in the Bulletin I will not say any more than it was extremely successful and was apparently enjoyed by all.

On 1981 August 5 about 45 members and friends visited the controversial Newport D gas fired power station. This station met with considerable opposition from local residents and conservation groups before and during its construction.

To meet requirements placed on it by the E.P.A., the State Electricity Commission of Victoria has carried out a considerable amount of acoustic work and members were most impressed with the low levels of noise achieved both inside and outside the station.

Of particular interest was the switch gear used. To reduce both the noise and the size of the switch gear gas filled switches were used. This has enabled the S.E.C. to locate the switches inside the building and has greatly improved safety in this area.

The steam relief valves also impressed our members as their noise level was in the order of 12 dB less than conventional valves.

After this most interesting tour the S.E.C. provided a very enjoyable supper. All in all it was an excellent evening and I thank the S.E.C. especially for making the staff available to answer the questions from our members.

On 6th October, 1981 the Division had a joint technical meeting with the Institution of Engineers Australia. The topic for this meeting was "Vibro Acoustic aspects of the N.A.S.A. space program".

David Rennison, formerly from B.B. & N. and now with Vipac and Partners Pty. Ltd., talked about his work on the space shuttle Columbia. I was unfortunately unable to attend but from all the reports I have received it was extremely interesting.

Apparently David's main task related to the prediction, using analytical techniques, of the noise level in the cargo hold of the Columbia. This was necessary as the hold will be required to carry sensitive equipment which could be affected by high levels of noise and vibration. High levels in the Columbia arose due to the close proximity of its engines.

David pointed out that once the noise and vibration levels are known the equipment that it is intended to carry into space can be designed or modified appropriately.

One area David specifically talked about was the cargo doors. Apparently as they are not subjected to the high temperatures that other areas are they have been made of light weight material. This material provides little attenuation.

The final prediction made by David and his associates was apparently within 3 dB of the actual noise level measured during Columbia's only flight.

John Lambert

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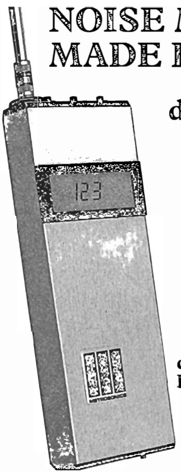

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CONFERENCES & SYMPOSIA

FIFTH NATIONAL CONFERENCE

AUDIOLOGICAL SOCIETY OF AUSTRALIA

JUNE 1982

The fifth national conference of the Audiological Society of Australia will be held from 5th to 7th June 1982 inclusive at Leura, in the Blue Mountains, approximately 100 km west of Sydney.

The programme will include scientific papers and organised discussion sessions. A call for papers will be distributed in November 1981.

Overseas speakers will include Dr. Gerald Studebaker and Dr. Robyn Cox from Memphis State University and Dr. Robert W. Keith from the University of Cincinatti Medical Center.

The conference will be preceded by two days of workshops, to be held in Sydney, on topics selected to have a wide appeal to conference participants. Some of the workshops will be conducted by the overseas speakers.

If you would like further information and announcements about the conference and the workshops, have your name placed on the mailing list by writing to:

The Conference Convenor,
Ms. L. Goodall,
National Acoustic Laboratory Training Centre,
7th Floor, Proverb House,
71 Archer Street,
CHATSWOOD, NSW, 2067

FOURTEEN COURSE ON OCCUPATIONAL HEALTH FOR INDUSTRY

University of Sydney

The course is to be held from Monday, February 15, to Friday, February 19, under the auspices of the Sydney University Extension Programme and the Commonwealth Institute of Health in this University.

As in past years, the course is designed to provide a broad introduction to Occupational Health and is open to managerial personnel, safety officers, occupational health nurses, union officials, engineers, physicists, chemists, work study and training officers, and other persons possessing suitable qualifications or experience. The main subject areas will be:

*The scope of occupational health *Industrial dusts, fumes, gases and vapours *Occupational hazards of metals, solvents, pesticides and other chemicals *Noise *Ventilation *Ionizing radiations *Occupational disorders of the skin *Ergonomics *Sickness absence *Mental health in industry *Prevention and control of occupational hazards *Occupational health services.

The course will take place in the Bosch Lecture Theatre complex in the grounds of the University, from 9.00 a.m. to 5.00 p.m. each day, Monday to Friday inclusive. It is not residential.

The closing date for full payment is December 11. Should there be any problem in meeting this deadline, however, please do not hesitate to ring to discuss it with Ms. Czako. The number is (02) 692 3177.

Enquiries and Enrolments: please post to:

Ms. Margaret Czako,
Programme Assistant,
Extension Programme, KO1,
University of Sydney, NSW, 2006.

SECOND NATIONAL SYMPOSIUM ON ULTRASONICS, (NSU), NEW DELHI,

Feb 23-24, 1982

1. Scope and Objectives:

The Ultrasonic Society of India, New Delhi is organising a National Symposium on Ultrasonics (NSU) jointly co-sponsored by the National Physical Laboratory of India on Feb 23-24, 1982. The symposium will cover the following topics in the field of ultrasonics:-

A. High power ultrasonics.
B. Ultrasonic instruments.
C. Ultrasonic transducer - materials and devices.
D. Physics of Ultrasound.
E. Medical and biological ultrasonics.
F. Ultrasonic non-destructive testing and acoustic emission.
G. Acoustic microscopy and ultrasonic spectroscopy.
H. Visualization and imaging.
I. Underwater ultrasound.
J. Agriculture research using ultrasound.
K. Unclassified.

2. Venue

The second NSU is planned to be held at the National Physical Laboratory, Hillside Road, New Delhi-110012, India.

3. Information may be obtained from:

Dr. V.R. Singh, Convener, (Second NSU),
General Secretary,
Ultrasonic Society of India,
C/o Ultrasonic Section,
National Physical Laboratory,
Hillside Road, New Delhi-110012,
INDIA.

NOISE!

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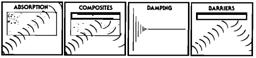
Damping thick metal plates	subway wheels; transformers; bridges; gears; ship bulkheads and decks; machine tools	DYAD	108
Damping and Absorption	machinery housings; in-plant enclosures	Foam Damping Sheet	109
Absorption	business machines; enclosures; pipe wrapping; lining sound trapping labyrinths; anechoic chambers	Soundfoam/Embossed Soundfoam	102 101
Absorption and Barriers	machinery enclosures; business machines; yacht and recreational vehicle generators; appliances	Soundmat LF/Embossed Soundmat LF/Film Facings	110 103/110
Absorption with special surface treatments	near liquid spray equipment; cleanable surface applications; marine applications	Soundfoam/matte film finish Soundfoam/fabric facing Soundfoam/Tedlar® Soundfoam/metalized Mylar® Soundfoam/tufted fibre	103 116 103 103 116
Absorption for vehicle cabs	headliners and side panels for cabs for off-highway vehicles and similar applications	Cabfoam Soundfoam/perforated vinyl	104 103
Barriers	vehicle floors; pipe wrapping; curtain walls; enclosure access	Soundmat FVP Soundmat FV Soundfab	113 111 112

Nylex noise control materials are available for a wide variety of applications requiring Absorption, Barrier and Vibration Damping treatment methods.

Nylex specialised problem-solving capabilities include application engineering services, custom fabrication, die-cutting and installation facilities where required, to provide the most cost effective solutions to noise control problems in vehicles, boats, aircraft, domestic appliances and many other types of equipment; whether on existing plant and equipment, or new product development with original equipment.

For a copy of our latest Noise Control Materials Bulletin No. 200, covering the range of materials available, contact:
The Manager, Noise Control Materials
Nylex Corporation Limited
P.O. Box 68, Mentone, Victoria 3194. Phone (03) 581 0211
or any of Nylex State offices.



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Brisbane 371 3066 Adelaide 258 4000 Newcastle 69 2188
A.C.T. 80 4598

Nylex noise control materials are manufactured under licence to The Soundcoat Company, Inc., N.Y., U.S.A.

0032NYL NC

INTER-NOISE 82 TO BE HELD IN SAN FRANCISCO

INTER-NOISE 82, the eleventh International Conference on Noise Control Engineering will be held at the Jack Tar Hotel in San Francisco on May 17-19, 1982. The conference is sponsored by the International Institute of Noise Control Engineering and will be organized by the Institute of Noise Control Engineering of the United States of America.

The conference will be held ten years after the enactment of the Noise Control Act of 1972, and the theme will be "Noise Control: Ten Years Later."

INTER-NOISE 82 will feature an exhibition of materials and equipment for noise control. Technical papers in all areas of noise control engineering will be presented during the three-day conference. A special feature of INTER-NOISE 82 will be the presentation of both retrospective and prospective dialogues on noise control engineering and its impact on society. It is hoped that the retrospective and prospective viewers will bring the delegates to the conference solid evidence of past progress and future hope.

Further information on INTER-NOISE 82 may be obtained from the Conference Secretariat, Noise Control Foundation, P.O. Box 3469, Arlington Branch, Poughkeepsie, New York 12603, U.S.A.

INTER-NOISE 80 PROCEEDINGS ARE AVAILABLE

More than 600 engineers concerned with noise control attended INTER-NOISE 80, the 1980 International Conference on Noise Control Engineering which was held in Miami, Florida on 08-10 December 1980. The meeting covered a very wide variety of topics, including machinery noise control, impact noise, land use planning around airports, instrument calibration and certification, rapid transit system noise control, building noise control, valve noise, active noise attenuators and many other subjects in noise control engineering.

The papers presented at the conference have been collected into a two-volume set of Conference Proceedings which contain a total fo 1,296 pages. The book, edited by Dr. George C. Maling, Jr., is a comprehensive summary of the state of the technology in noise control. Copies of the Proceedings are available for $49.50 from Noise Control Foundation, P.O. Box 3469, Arlington Branch, Poughkeepsie, NY 12603, U.S.A. The two-volume set is mailed within the United States and overseas by surface mail at no cost. For shipment of the set overseas by air, there is a $25.00 additional charge for air mail postage, packing and handling.

INTER-NOISE PROCEEDINGS

The Proceedings of all of the INTER-NOISE Conferences are available for immediate shipment by Noise Control Foundation. The Proceedings contain a wide variety of technical information on all aspects of noise control and should be in the library of all individuals professionally concerned with noise control. In addition to the Conference Proceedings, a volume of tutorial papers on noise control is available.

The following volumes may be ordered:

INTER-NOISE 72 TUTORIALS. Seventeen tutorial papers on important basic areas of noise control. Washington, D.C., U.S.A., 4-6 October 1972, 134 pp.

INTER-NOISE 72 PROCEEDINGS. Ninety-two papers on the technology of noise control. Washington, D.C., U.S.A., 4-6 October 1972, 564 pp.

INTER-NOISE 73 PROCEEDINGS. Ninety-six papers, all in English, on the technology of noise control. Copenhagen, Denmark, 22-24 August 1973, 635 pp.

INTER-NOISE 74 PROCEEDINGS. One hundred and forty papers covering all aspects of noise control engineering. Washington, D.C., U.S.A., 30 September - 2 October 1974, 692 pp.

INTER-NOISE 75 PROCEEDINGS. One hundred and forty-one papers, all in English, covering all aspects of the technology of noise control. Sendai, Japan 27-29 August 1975, 718 pp.

INTER-NOISE 76 PROCEEDINGS. More than one hundred papers prepared by noise control specialists from around the world. Washington, D.C., U.S.A., 5-7 April, 1976, 561 pp.

INTER-NOISE 77 PROCEEDINGS. Theme: "Noise Control: The Engineer's Responsiblity", one hundred and thirty-seven papers, all in English, covering all aspects of noise control. Zurich, Switzerland, 1-3 March 1977, 986 pp.

INTER-NOISE 78 PROCEEDINGS. Theme: "Designing for Noise Control", one hundred and sixty seven papers covering all aspects of noise control. San Francisco, CA, U.S.A., 8-10 May 1978, 1058 pp.

INTER-NOISE 79 PROCEEDINGS. One hundred and eighty-one papers, all in English, covering all aspects of noise control. Warsaw, Poland, 11-13 September 1979. Published in two volumes; vol. 1, 474 pp., vol. 2, 471 pp.

ENQUIRIES TO:

NOISE CONTROL FOUNDATION,
P.O. Box 3469, Arlington Branch,
Poughkeepsie, NY 12603 U.S.A.

NEW PRODUCTS

BUILDING ACOUSTICS ANALYZER

A microcomputer controlled serial analyzer for the automatic measurement and subsequent calculation of the common quantities of interest in building acoustics, and for precision sound power measurements, is announced by Bruel and Kjaer.

The lightweight (7 kg: 15 lb) and battery operated 4417 is primarily intended for the control of sound insulation in new buildings but can also be used for noise control and for investigations of building materials, auditoria and concert halls.

The measurements and calculations which the 4417 can perform are based on ISO 140, parts 1 to 8, ISO R 354, ISO R 717, ISO 3382 and ISO 3741 and ISO 3742. However, the 4417 can also measure and calculate according to most comparable national standards.

When used with a minimum of accessories (i.e. a microphone, loudspeaker and a power amplifier) the 4417 can be programmed to measure and retain in its memory data for 3 sound pressure level spectra and 1 reverberation time spectrum. Furthermore, when used in conjunction with a rotating microphone boom, or an array of microphones and a multiplexer, the 4417 enables spatial averaging to be performed automatically.

From the measurement data and the entered values of the room's volume and the room's (or wall's) surface area, the 4417 will calculate any or all of 9 important spectra in 20 third-octave bands covering the frequency range 100 Hz to 8 kHz (centre frequency), e.g. impact and airborne sound insulation, sound power, normalised and standardised levels. The results can be presented digitally on the 4417's liquid crystal display, graphically via a level recorder, printed via an alphanumeric printer or stored on a digital cassette recorder.

8 CHANNEL MULTIPLEXER TYPE 2811

An 8 channel microphone multiplexer for multi-microphone measurements has been introduced by Bruel & Kjaer.

Primarily for measurements with the Sound Power Calculator Type 7507, the 2811 features scanning of up to 8 microphone or direct input channels, controlled manually, automatically from a built-in clock (9 dwell times), or externally. Up to four 2811's may be combined to multiplex a total of 32 channels. A built-in IEC 625-1 compatible interface permits external scanning by controller and independent scanning of a second multiplexer built into the 2811. Under IEC bus control the multiplexer can stop and start ancillary equipment such as a noise generator or a sound power source for reverberation time measurements. Also included are facilities for by-passing or selecting individual channels and resetting scan.

Two inputs are available for each channel, a standard B & K 7-pin socket which accepts the relevant microphone amplifiers and gives the choice of 0V, 28V or 200V polarisation voltage, and a direct input via a standard BNC socket. The BNC sockets double as channel outputs for recording and monitoring. Each channel has ±3 dB channel sensitivity adjustment and a dual LED tuning-type indicator for calibrating. Frequency response is 2 Hz - 200 kHz ± 0.5 dB, cross-talk is better than -80 dB up to 20 kHz and -60 dB up to 200 kHz.

ELECTROACOUSTIC TELEPHONE TRANSMISSION MEASURING SYSTEM

The well-established Electroacoustic Telephone Transmission Measuring System from Bruel & Kjaer has been modified in accordance with new instruments from the range of electroacoustic measuring equipment.

The major changes are as follows:

The Measuring Amplifier Type 2608 has been replaced by Type 2610, and the Audio Freuquency Spectrometer Type 2113 has been replaced by a Measuring Amplifier 2610 and a Band Pass Filter Type 1618.

The modified system Type 3356 features simplified operation, but there is no change in the basic working principle, and full compatibility with the old systems is thus secured.

The Electroacoustic Telephone Transmission Measuring System is mainly used for electroacoustic laboratory measurements on complete telephone subsets and telephone lines. It is extremely stable and complies with all known national and international standards.

The system uses a Telephone Test Head that positions the telephone handset firmly with respect to an Artificial Voice. The Test Head also holds the different Artificial Ears. A stable sine-wave sweep is fed to the telephone, acoustically or electrically, and the electrical or acoustical output is routed to different instruments for further measurement, analysis, display and recording. For normal work all switching is done from a central panel and no cable changes are necessary. The system is fully self-contained and easily calibrated.

DIRECTORY ADDENDUM

The first Directory of members of the Society was published in June 1980. Since then, a number of changes have occurred to the membership. These include changes to members' work-place, position held, and choice of interests in acoustics. As well, several members were removed from the Society's register due to resignation, deceased. Other names were removed due to change of name, change in membership grade or transfers to other Divisions. Those member's names re-appear under the appropriate section in the addendum. Many new members were admitted to the Society and their names and addresses appear in the Directory addendum.

Additions to the Directory are identified in the addendum by a +ve sign directly in front of the member's surname. Names which should be removed from your copy of the 1980 Directory are identified by a -ve sign directly in front of the member's name. Otherwise the addendum follows the same format to that of the Directory - 1980.

Over the next two years it is proposed to issue a new edition of the Directory incorporating all changes in the membership. To be an accurate and useful document, it is most important that all members notify their local Divisions of any changes to their entry that are appropriate.

Special thanks are due to the National Association of Testing Authorities for their assistance and for the use of their facilities in preparing the addendum.

Anita B. Lawrence
President

SUSTAINING MEMBERS

NAME OF SUSTAINING MEMBER	RESUME OF INTEREST IN ACOUSTICS	CONTACT
CRA Services Ltd.		Tom Farrell, Environmental Scientist CRA Services Ltd. 55 Collins Street, MELBOURNE, VIC., 3001
Peace Engineering Pty. Ltd.	Design, manufacturing and installing noise control equipment. Contractors to industrial and commercial users of full range of noise control products.	Graham B. Shelley-Jones, Director, Peace Engineering Pty. Ltd., 2 Amour Street, MILPERRA, NSW, 2214

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Mr L G +Morgan			131 Maroondah Hwy	CROYDON	3136		
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Mr A B	-Horsley							
Dr S H	(Sharann) Johnson	OccHygien	BP Aust Ltd	1 Albert Rd	MELBOURNE	3004	a c	m 2684705
Mr D E	(Dieter) Plate	P R Scien	CSIRO Dvn of Textile Industry	PO Box 21	BELMONT	3216	c	m 472611
Mr B W	-Stinson							
Mr J G	+Stone							
Mr K M	-Watson							
Mr D J	(Doug) Watt	SolTrader	Douglas J Watt	19 Winters Way	DONCASTER	3108	a c d e	m 4593734
Mr E	(Ed) Williams	Principal	Ed Williams & Associates	1 Cookson St	CAMBERWELL	3124	c e	821326

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Mr A F	(Allan) +Herring	Cons Eng	Ron Carr & Company P/L	14 Stone St	SOUTH PERTH	6151	c d e	3676200
Mr J C	(Jim) McNulty	Comm P H	Public Health Department	60 Beaufort St	PERTH	6000	c	3280241
Dr P	(Michael)+Norton	Lecturer	University of WA	Mechanical Dept	NEDLANDS	6009	c d i j	m
Mr P M	+Sellick		University of WA	Physiology Dept	NEDLANDS	6009		
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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. 10 No. 1 Longer articles: Mid December; Shorter articles: Mid February.
NOTE: VOLUME 10 WILL BE PRODUCED IN NSW (See inside front cover).

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.