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EDITORIAL

Traditionally, after the first one hundred days, one year, or some such appropriate interval, progress over the period is reviewed. Although aiming for an earlier start, the Bulletin was first launched with the issue for Autumn 1972. Now, with this issue for Autumn 1973, the Bulletin can look back over its first twelve months of existence.

There were production problems in profusion in that year. Initially, the number of covers ordered fell below the number of members, which had increased by the time the first editions were finally ready to be issued. Then frantic searches occurred on occasions, to locate texts when different people involved have had to proceed interstate (and even overseas) at short notice. Attempts to piece the resulting puzzles together have necessitated, at times, a complete rearrangement and re-typing. And to these difficulties have been added the normal number of printer's errors.

All these problems, of course, are those that might reasonably be expected in a settling-down period, particularly when those involved must function on a part-time basis. They are not relevant to any review except insofar as they relate to changes in the objectives laid down originally for the Bulletin.

Initially it was intended that alternate issues would be produced by the NSW and Victoria Divisions. Although not then stated, it was hoped that the load, partially distributed in this way, might be able to be distributed even more widely within a reasonable time to other Divisions then about to be formed. In this way a Division might have expected to have to bring out an issue only once in any twelve months period. It became evident that on this basis each State involved would face the problems of production almost afresh on each occasion. The opportunities to gain expertise would tend to diminish, co-ordination in the acquisition of material would be difficult, and uniformity in presentation might become almost impossible. Accordingly, Federal Council, in its lengthy discussions at the Society's 1972 Conference at Terrigal, vested the responsibility for publication in NSW. That Division believes it may shortly surmount the problems that initially beset the production of a uniform, good-looking publication. It expects, too, that the long delays that would have arisen in getting an issue into circulation will soon be obviated. With these difficulties disposed of the emphasis falls on content, and on the procurement of material which will be of sufficient diversity to reflect the interests of the Society, and which will come from sufficiently far afield to reflect its nationwide character.

At this stage, although production is concentrated in NSW, the acquisition of material is still shared between the NSW and Victoria Divisions. On this basis the two most populous States provide alternate issues in their separate entities. While no early change in this arrangement seems likely or possible, a more desirable practice would seem to be that as wide a coverage as possible should be given in all issues to all Divisions. Obviously, further changes must be effected to achieve such an objective. It is believed to be beyond the capability of small groups of individuals in two (or more) States to arrange for contributions and Society news to be garnered from throughout Australia. Accordingly, an arrangement such as an editorial board with at least one member in each State would appear to be indicated. Hopefully, articles and information can be obtained by the members of the board from within their sphere of operation. Once they are satisfied that the material has been brought to a standard suitable for publication they can pass it on for inclusion in the next appropriate issue of the Bulletin.

The availability of technical articles for publication has been a pleasing aspect of the period under review. Contributions have been volunteered with a degree of enthusiasm which suggests that, unless there is some marked deterioration in attitude, the Bulletin can expect to grow in strength by providing a variety of technical articles in every issue. One surprising aspect of the period, however, has been the absence of contributions giving vent to critical comment on Society affairs. The aims of the Society and the manner of their fulfillment are known to have been subject to intense criticism at times from many of the members. It would be strange if such criticism did not arise. In fact its absence might suggest an unhealthy attitude of apathy, auguring stagnation in the future.

A wide range of matters has been discussed vigorously in pre-meeting conversations and whenever Society members have gathered together. There is certain to have been a great many more discussions because those which have been heard and reported must represent only a small sample of the number that could actually have taken place. Yet, strangely, in this year under review, none of the controversies, with one exception, has been presented for wider circulation through the Bulletin. As the Bulletin reaches out to all members, it seems that in cases where policy or procedure is thought to require change a logical way to gain support for such a purpose would be by way of the Bulletin.

A.A.S. ACTIVITIES

The NSW Division of the Society opened its 1973 season of technical meetings with an address, "Acoustical Oceanography" by Professor Herman Medwin, Professor of Physics at the Naval Postgraduate School, Monterey, U.S.A. Professor Medwin's talk, which was held at The University of New South Wales on 7 February, was preceded by one of those excellent functions in the Senior Common Room with drinks at 6 pm followed by dinner.

Dr. Hunter reports:

Our first technical meeting for 1973 was a pleasant affair with Dr. Hank Medwin, who is on sabbatical leave at the RAN Research Laboratory, Rushcutters Bay, telling us of the use of acoustics in the study of oceanography. He mentioned acoustic shadowgraphs of the sea floor obtained from back-scattered sound, and reminded us that the power spectrum of the incoherent part of sound forward scattered from the sea/air interface is the same as the spectrum of the vertical displacement of the interface.

After briefly mentioning a few other applications of acoustics in oceanography during which the roughening of the interior walls of the Sydney Opera House (i.e. the one still under construction) was compared with the acoustical roughness parameter for sea surface scattering, he said something to the effect of "Enough of this beating about the bush - now down to business!" At this he settled into his favourite subject of the physics and acoustics of gas bubbles in the sea. Commending us to study the bubbles in our schooners before drinking the beer (and to replicate the experiment as necessary in the interest of science), he persuaded us that there are gas bubbles in the sea. These arise not only from convection of bubbles from breaking waves, but also from photosynthesis, marine life digestion processes and organic decay. In addition to the gas evacuation by filthy dinoflagellates (plankton) there are the gas-filled swim bladders of many fish, used to control buoyancy. He described the apparatus and techniques used by his students at Monterey to study the spatial and size distribution of gas bubbles in a laboratory tank and in the sea near California. The concentration is a maximum for bubbles of about 60 microns radius: smaller bubbles dissolve and large ones levitate out. He is also repeating these experiments in Bass Strait during his Australian tour.

Analysing the expressions on some of the faces in the audience at this stage he then went on to explain why gas bubbles in the ocean are important. A bubble at its resonance frequency has an acoustic scattering cross section many times its geometrical cross section. Thus a very sparse distribution of quite small bubbles can have a profound effect on the back-scattering of sound, showing up distinctly on echo sounder records. Moreoever, the phase velocity of sound in a liquid is profoundly influenced by the presence of a small proportion of bubbles. For example, for a concentration of 10^{-4} by volume of 60 micron bubbles, the sound velocity for frequencies below 30 kHz is half that in bubble-free water. Above 100 kHz the sound velocity is the same as that in bubble-free water and near the resonance frequency of about 54 kHz, the sound velocity has an orgasm. This has important implications for those wishing to measure distance by acoustic travel time in the ocean.

In question time, Professor Medwin said that he believed the mechanism for the persistence of bubbles was one of a nett diffusion of dissolved gas into the bubble as a result of oscillations of the bubble under the pressure fluctuations caused by surface wave action.

CONFERENCE ON ACOUSTIC AND VIBRATION SIGNAL ANALYSIS

The University of New South Wales has organised a conference on modern methods of signal analysis as applied to acoustic and vibration problems to be held in conjunction with the University's 3rd Annual Noise Seminar. The purpose of the conference, which was held on Friday 6th July 1973, was to examine the available methods of signal analysis and to discuss the techniques in relation to representative problems.

The conference ran from 9.30 am to 5 pm, with a dinner to follow. There was an exhibition of instruments to provide an appropriate complement to the papers.

NOISE, SHOCK AND VIBRATION CONFERENCE 1974

The Victoria Division of the Society is co-sponsor with the Department of Mechanical Engineering of Monash University and the Instititution of Engineers Australia of a conference to be held on 22 to 25 May 1974 at Monash University, Melbourne. As the title indicates, the conference theme is noise, shock, and vibration, and invitations have been issued for papers on original research and investigational work in these fields. It is intended to publish the papers for the conference in a bound volume that will be issued to delegates in advance.

NEWS AND NOTES

GRADUATE COURSE -- ENVIRONMENTAL ACOUSTICS

The University of Sydney is offering a graduate course in mechanical engineering on environmental acoustics, commencing 7 June 1973. The syllabus includes the measurement of noise, aerodynamic and aircraft noise, vibration, acoustic coupling, and random noise transmission. Other aspects covered are the physiological effects of noise, industrial noise, exposure indices, community noise measurement and criteria, and transportation noise.

The lecturers are Dr. I.S.F. Jones, Mr. W.L.J. Bourke, Professor R.E. Luxton, Professor H.M. Nelson, and Mr. L.A. Challis. The course may be included as part of a programme of work leading to the degree of M. Eng. Sc., or may be undertaken as a separate course of study. Information on the course may be obtained from Professor Luxton of the Department of Mechanical Engineering.

TECHNICAL SALES INFORMATION SERVICE

Some members of the NSW Division have been impressed by a service providing, at frequent regular intervals, the latest data on commercially-available engineering and electronic products. They have suggested that others in the Society be informed of this service in the belief that they may find it equally useful in their work.

Basically the service consists of a library of technical sales information that is kept updated by the deletion or addition of material as new information becomes available. Maintenance of the latest information is ensured by personal visits to each catalogue library throughout Australia at regular 8-weekly intervals.

The library is supplemented by an index system to enable quick reference to the particular sections within the library where data is to be found on products that may be sought to fulfill a specific purpose. The service also provides an Enquiry Bureau to cope with the more difficult situations when the library itself does not appear to contain information on products needed to satisfy the requirements of unusual or more rigorous applications.

The library is available at this stage in two main parts. The first gives comprehensive coverage of the products for general engineering use, whereas the second is a parallel system devoted to products of the Australian electronics industry. The latter classification of information, which was originally commissioned to be assembled by the Department of Supply, is the one thought likely to be of greatest interest to AAS members. Included in it is a directory of the electronics industry which is produced on a continuing basis at 6-monthly intervals.

Information on this system of documentation of technical sales material is available from Technical Indexes at the New South Wales Office or at the Head Office of the Company in Melbourne.

CETIA-NATA CONFERENCE

The National Association of Testing Authorities, Australia, in conjunction with CETIA, will hold a one-day symposium at the ROTHMANS THEATRE, SHOWGROUND on Tuesday, 18th September 1973.

The subject of this symposium will be aspects of noise measurement and control.

Further details will be released at a later date.

METHODS OF RATING IMPULSIVE NOISE FOR HEARING CONSERVATION PURPOSES

R. A. PIESSE

Commonwealth Acoustic Laboratories

The Draft Australian Standard Code of Practice DR72084 recognizes the difficulties of dealing with this very important cause of hearing damage in industry. Damage results from the effects of high level transient sounds caused by sudden changes of air pressure due to rapid expansion of gases (impulsive sound) and to impacts between solids (impact sound). The inclusion of crude procedures for determining acceptable limits of exposure to this type of noise is a definite limitation to the use of this code in many industries and in particular the metal trades, where noise exposures often consist of a regular series of transient sounds, with repetition rates varying from many times per second to once every few seconds or even minutes, e.g., rivetting, drop forging, pressing, etc., also in the building trades where explosive fastening tools are now more frequently used.

At least three procedures for determining acceptable limits to exposure to impulsive noise have been developed. These are as follows:

1. In 1968[1] the U.S.A. National Academy of Science - National Research Council Committee on Hearing, Bioacoustics and Biomechanics (CHABA) developed acceptable limits for exposure to impulse noise of the type produced by gunfire. These limits are expressed in terms of the number, peak sound pressure level and duration of the impulses and are designed to prevent 95% of exposed individuals from receiving a temporary threshold shifts of more than 10 dB at 1000 Hz, 15 dB at 2000 Hz or 20 dB at 3000 Hz or above at the end of a day's exposure. In developing the critèrion it was assumed that many years of expósure to a noise which produced temporary threshold shifts of this amount in one day would cause a permanent change in hearing acuity of approximately the same amount. In recent years this assumption is receiving less support and therefore the criterion must be used with some caution.

2. The second is a procedure developed by K. Kryter[2] which also uses temporary threshold shift to predict permanent threshold shift. The threshold shift is estimated from a knowledge of the spectral and temporary characteristics of the set of impulses. The time-pressure waveform is converted into an energy spectrum level and then into a one-third octave band spectrum which is compared with a series of damage risk contours. Once the one-third octave spectrum is obtained the procedure used is identical with that used for continuous and intermittent noise.

3. Atherly and Martin[3] developed a procedure for calculating for impact and certain types of impulsive noise an equivalent continuous noise lev el in "A" weighted sound level. The peak sound level repetition rate and the decay time constant of the waveform envelope are used to perform this calculation. The equivalent continuous noise level is then used to derive a noise immission which is the total frequency weighted energy received over a relatively long period, i.e., months or years and related to the risk of hearing loss.

Unfortunately the application of each of the above procedures requires sophisticated equipment and experienced operators except that, for the procedure developed by Atherly and Martin, an instrument has recently been developed to automatically measure equivalent continuous noise level of a wide variety of noises, including impulsive sounds. This instrument has not been evaluated in this country at the time of writing but appears to offer advantages over sound level meters and noise dosage meters for rating noise in respect to conservation of hearing. Generally the methods are not suitable for use in industrial hearing conservation programs where most of the present codes of practice and standards specify simple methods of sound measurement which can be used by people without special acoustical knowledge. The only exception known to us is the British "Code of Practice for Reducing the Exposure of Employed Persons to Noise" which recommends the use of graphic level recorders, statistical analysers, noise meters, magnetic tape recorders and oscilloscopes for the measurement of fluctuating, intermittent and impulsive noise levels.

The International Standards Organisation "Recommendation R1999 Assessment of Occupational Noise Exposure for Hearing Conservation Purposes" proposes a simplified procedure for certain common types of impulsive noise. This standard specifies a sound level meter set to "A" weighting and 'slow' response for the measurement of noise bursts of approximately equal amplitudes (for example noise from rapidly repeated hammering or rivetting) a correction of 10 dB(A) should be added to the measured sound level" which is then used in the calculation of equivalent continuous sound level for comparison with the chosen criterion. The circumstances under which this correction should be applied are not defined and therefore the method loses much of its value.

The only legislation dealing with impulsive noise presently known to us is the Walsh-Healey Act which applies to firms entering contracts with the Government of the U.S.A., and in its slightly modified form the Occupational Safety and Health Act 1971 which specifies that "exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level". Unfortunately impulsive or impact noise are not defined but as the peak sound pressure level agrees closely with the maximum acceptable peak level for 100 impulses per day under reverberant conditions for the CHABA system, it seems likely that this clause is to be applied to widely separated impulses only. A further clause which states that "If the variations in noise level involve maxima at intervals of 1 second or less, it is to be considered continuous" is probably applied to repetitive impulse noise such as hammering, rivetting, etc. In the absence of other information, it is thought that this and all other types of noise are to be measured on a sound level meter set to "A" weighting and 'slow' response.

The U.S. Department of Health Education and Welfare's recommended standard for "Occupational Exposure to Noise" specifies that noise levels shall be measured on the "A" weighting of a sound level meter set to 'slow' response and a procedure is given for determining the permitted daily noise exposure for a wide range of noise levels. The recommendation states that "The provisions of this standard ..... are intended to apply for all noise even though additional controls may be necessary for certain specific types of noise, such as some impact and impulsive noise". However, no additional controls are specified in the document. The standard further specifies that "at no time shall any worker be exposed to effective noise levels exceeding 115 dBA-slow" which in the absence of explanatory information could be interpreted to include all forms of noise including impulsive and impact noise.

The use of a sound level meter to rate impulsive noise for conserving hearing for legislative purposes has advantages from the point of view of simplicity and cost. In view of current interest in legislation in this country, C.A.L. have decided to undertake a survey of various types of impulsive and impact noise to compare the levels as measured on the sound level meter with acceptable levels as determined by the abovementioned more sophisticated procedures. This survey is only in its initial stages but some of the preliminary results that have been obtained on explosive fastening tools are reported for general interest.

The measurements were obtained at the ear position of the operator of a well known make of explosive fastening tool firing pins or studs into a steel beam or concrete surface inside a room in which the ceiling was lined with acoustic tiles and the walls were constructed from either solid wood panelling or masonry. Two Bruel and Kjaer Type 4136 quarter inch condensor microphones were mounted on tripods beside the tool operator. The output of one of the microphones was fed to two Bruel and Kjaer Type 2203 Precision Sound Level Meters and a Tektronix Type 549 Storage Oscilloscope. The sound level meters measured "A" weighted sound pressure levels (dBA) on fast and slow meter response respectively, while the oscilloscope measured peak sound level and duration of the impulse. The second microphone was coupled to a Bruel and Kjaer Type 2204 Impulse Precision Sound Level Meter which was set to dBA Hold. The duration of the impulse was the time during which the noise level of each shot remained within 20 dB of the peak level.

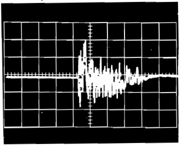
IMPULSIVE NOISE RATING (cont'd)

The results of the various measurements of the noise of single shots of explosive fastening tools are shown in the following table, which also shows the permissible number of shots per day calculated using the CHABA procedure.

Typical waveform for the impulses is shown in the following photograph of the oscilloscope trace. The time scale is 50 milliseconds per centimetre.

T A B L E 1

Type of Tool	Cartridge	Pin or Stud	Target	Slow	Fast	Hold	CRO Peak dB	Duration	Permissible Number a Day
1.	A	Pin	Concrete	104	114	117.5	141	0.31	24
	B	Pin	Concrete	100	112	117	138	0.23	70
	A	Stud	Concrete	96	107	110	140	0.15	60
	A	Stud	Steel Beam	111	122	128	143.5	0.18	9
	C	Pin	Concrete	100	114	123	142	0.12	30
	C	Stud	Steel Beam	108	118	122	142	0.18	18
	D	Nail	Concrete	99	111	115	141	0.18	30
	D	Stud	Steel Beam	109	121	124	143	0.19	10



The influence of structure born vibrations on the instrumentation and therefore on the measured sound levels is unknown at this stage and is being investigated further.

The results show that the sound level as measured on the sound level meter is highly dependant on the types of material into which the stud or pin is fired. Other factors such as charge and type of pin have very little effect at least for the types of charges and pins used in this study.

The results at this stage tend to show that fairly gross errors as compared with the CHABA criterion would arise if a sound level meter is used to rate isolated impulses even if a correction was applied for the number of exposures per day. The results also show that if peak levels of up to 115 dBA-slow from this type of impulse were permitted as in the above American recommendations, over exposures would occur with a resultant increase in the risk of damage to hearing.

Acknowledgements

I am grateful to Mr. J.A. Rose for his assistance and to Mr. D. Heinke and members of the C.A.L. Noise Investigation Section for carrying out the measurements.

This work is published by permission of the Director-General of Health.

References

1. Proposed Damage Risk Criterion for Impulse Noise (Gunfire). NAS-NRC Committee on Hearing, Bioacoustics and Biomechanics, 1968.

2. The Effects of Noise on Man. K.D. Kryter. Academic Press, 1970.

3. Equivalent-Continuous Noise Level as a Measure of Injury from Impact and Impulse Noise. G.R.C. Atherly and A.M. Martin. Am. Occup. Hyg., Vol. 14, pp 11-28.

COMMUNITY NOISE STUDIES OVERSEAS

ANITA LAWRENCE

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This is a brief account of some of the interesting community noise work that I was able to learn about on my recent six months' study leave from The University of New South Wales. Community noise - particularly noise from aircraft and road traffic - is being studied actively in many parts of the world. The results of these studies are gradually percolating through into legislation, with greater or lesser effect, depending often on the socio-political consciousness of the government concerned.

JAPAN

In Japan I was fortunate in meeting several prominent acousticians working on traffic noise, including Professor Zyun-iti Maekawa of Kobe, and Professor Juichi Igarashi and M. Koyasu of Tokyo. The latter have been experimenting with a scale model "road" with a linear "traffic" source at the Kobayasi Institute of Physics; they have been measuring the effect of barriers and cuttings on traffic noise propagation. Professor Maekawa of course is well known for his work on barrier design. Japan has a particularly severe traffic noise problem, because of the construction of multi-level urban motorways right into the centre of many cities. This, combined with the still general use of lightweight, acoustically transparent housing leads to many complaints being received. The proposed extension of the super-express railway system to all parts of the main island is also causing misgivings regarding noise propagation. There seemed to be little progress in source noise reduction - most of the research appeared to be concentrated into barrier design, etc.

POLAND

Whatever one may or may not think about socialised societies, I found that in Poland community noise planning and architectural acoustics are not just textbook exercises, but are actively used in the planning and design of new buildings. A well-equipped acoustics Laboratory in the Building Technical Institute in Warsaw, under the direction of Dr. Jerzy Sadowski has four main sections dealing with urban acoustics, building acoustics, room acoustics and equipment acoustics. The urban acoustics group has carried out noise surveys in several large cities, including Warsaw, and has published "noise maps" which are used in urban planning and building design. Values of L_{50}, L_{10} in dB(A) were recorded and the results plotted for many measuring points. In addition, predictions of traffic noise levels have been made for various geometrical site configurations, traffic flow volumes and speeds. These, together with measurements of aircraft, railway and industrial noise are used as town planning guides for the siting of buildings. The building and room acoustics groups make use of the laboratory facilities, which include a reverberation room, transmission rooms and an anechoic chamber. Modern building techniques, elements and materials are tested in the laboratory and the field. (Assistance is also given with the design of auditoria and studios. I was taken to visit the Academy of Music, for which the Institute had carried out the acoustic design - a most effective design too. It was strange to walk along the corridor of such an Academy without hearing the usual cacophony emanating from practising students!) The equipment group is working on plumbing noise, including the requirements for a prefabricated sanitary cabin. Unfortunately, in common with the rest of the world, the Poles have still some way to go in reducing traffic noise - judging by my personal experience in a down-town hotel facing a main square. Not least of their problems is the fact that about 40% of their road traffic consists of heavy vehicles, and trams still bump their way across the points in the centre of town. Acoustic research in Poland is co-ordinated by the Acoustic Committee of the Polish Academy of

Science, consisting of thirty members drawn from universities and scientific institutes; the Polish Acoustical Association has some 400 members.

UNITED KINGDOM

There is a great deal of activity on all community noise "fronts" in the United Kingdom, and several establishments are actively engaged in various aspects of the traffic noise problem. Prominent amongst these are the Building Research Establishment at Garston, the Transport and Road Research Laboratory at Crowthorne, the Scientific Branch of the Greater London Council, the National Physical Laboratory at Teddington, and the Southampton Institute of Sound and Vibration Research (ISVR). Whilst I was in England the government White Paper, "Development and Compensation - Putting People First" (1) was presented to Parliament. This provides for compensation to be paid to individuals affected adversely by community developments. Noise figures prominently in the adverse effects considered, and "A new right to the sound insulation of livingrooms and bedrooms will be provided where dwellings will be subject to noise rising above prescribed levels as a consequence of the traffic on new roads or on roads where there have been major alterations." Compensation is also payable to owners or occupiers of small businesses. The noise level prescribed at present is the 18-hour value of L_{10} = 70 dB(A) or more, measured at 1m from the facade of the building. (This value is obtained from the arithmetic average of the hourly values of L_{10} over a weekday period between the hours of 06.00 and 24.00). This value of 70 dB(A) is recognised as being higher than desirable, and will be reviewed at a later date. However, in the climatic conditions of the UK it is expected that the minimum attenuation of a building will not be less than 10 dB(A) and that with windows closed 20 dB(A) or more could be hoped for. The results of the current London Noise Survey are expected soon, which will give further evidence both of the actual noise levels arising from a wide variety of traffic situations and flow rates and of subjective reactions to this noise.

Work is now proceeding on the provision of guidelines for predicting L_{10} levels for various traffic conditions and site configurations, together with the predicted effects of barriers, cuttings, etc. In addition, specifications of the required sound insulation standards are being prepared. (Incidentally the French are basing their predictions on L_{50} values which they found correlated well with the subjective reactions obtained in the Paris noise survey; Judith Lang in Vienna is persisting with L_{eq}.)

Recognising that compensation and sound insulation are only expedient solutions to the traffic noise problem, a considerable effort is directed toward the reduction of the noise at the source. It is considered that if the noise level of the noisiest vehicles, chiefly large diesel-engined goods vehicles, could be reduced a significant reduction could be made to the L_{10} levels existing generally. Thus an intensive study of the noise of diesel engines has been sponsored at the ISVR and at least two "quiet" engines are now in a fairly advanced stage of development - by "quiet" is meant an engine meeting the limit of 80 dB(A) in a British Standard "pass-by" test. At the risk of losing his entire audience through carbon monoxide poisoning, Professor Priede demonstrated the operation of a standard and a "quiet" engine during his inaugural lecture at Southampton University! It will obviously be some time before these engines are in commercial production, but it does appear that they are technologically possible.

However, in the Australian context, it must be remembered that our main traffic noise problems do not arise from the operation of high-speed urban motorways. Since these are more or less non-existent in this country, it arises from the slower traffic of intersection-riddled trunk roads, and the vehicle designed to be quiet at say 100 km/h may not necessarily be satisfactory under the conditions common to our urban roads.

It was refreshing to find official concern and financial support in the UK for the problems of noise in the community -- the effects of the proposed Advanced Passenger Train, for example, are to be studied; it was also informative to read the many publications available to the public giving background information regarding the effects of proposed community developments. For example, the Background Papers produced by the Greater London Council relating to the Greater London Development Plan, one of which states its purpose as "to assist objectors to form a judgement on the environmental effects of the construction of primary roads of motorway standard through established built-up areas.." - this must have been effective since the government has now abandoned the inner London ring-road proposals!

UNITED STATES

At the 84th meeting of the Acoustical Society of America in December, several sessions were concerned with community noise. The Office of Noise Abatement and Control of the Environmental Protection Agency (EPA) has been given the task of implementing the 1972 Noise Control Act. The policy behind this act is stated to be "to promote an environment for all Americans free from noise that jeopardizes their health or welfare by: effectively co-ordinating Federal research and activities in noise control; establishing Federal noise emission standards for products distributed in commerce; and providing information to the public respecting the noise emission and noise reduction characteristics of such products". The Act binds Federal agencies. The task of the EPA is "(1) to publish criteria which reflect the kind and extent of all identifiable effects on the public health or welfare resulting from differing quantities and qualities of noise (within 9 months); (2) .. to publish information on levels of environmental noise which in defined areas under various conditions are requisite to protect the public health and welfare with an adequate margin of safety (within 12 months)" ... quite a task indeed, considering that a few months had already elapsed between the passing of the Act by Congress and the actual provision of finance to carry out these activities!

EPA is specifically given authority to prescribe standards for noise of construction equipment, transportation equipment -- including recreational vehicles (snowmobiles are a hazard in Northern climates), motors, engines, electrical and electronic equipment. They are also to study the adequacy of current FAA flight and operational noise controls. Another interesting provision of the Act is for "noise" labels -- a product which - a) emits noise capable of adversely affecting the public health or welfare, or b) is sold wholly or in part on the basis of its effectiveness in reducing noise" must give the details on an attached label. Fines for violation or mis-labelling are up to $25,000 per day for each violation and to imprisonment of up to 1 year! On the positive side, action is to be taken to develop "low-noise emission products" which when certified as such, will be given Federal preference whenever possible.

It will be interesting to see how effective this Act will be - the US and Australia have many common problems of conflict between Federal and State authorities, and opinions in the US seemed to differ regarding the future success of the programme -- one can only wish them luck!

A study of the noise content of Environmental Impact Statements submitted in the New England region was reported at the Miami meeting by J.M. Garrelick (2). These statements ranged from a simple statement to the effect that no adverse noise effects were anticipated to complete acoustical surveys of the ambient levels and predicted future noise levels. He suggested that the authority requiring the impact statements should offer clear guidelines as to what is expected in the statements.

CANADA

In Canada I found considerable interest in sound insulation requirements for housing near airports. The National Research Council has assisted the Central Mortgage and Housing Corporation in producing a booklet, "New Housing and Airport Noise" (3) which gives guidelines firstly for establishing the extent of the airport noise problem at a site (in terms of NEF contours when available) and secondly for determining sound insulation requirements. The CMHC has defined three zones adjacent to airports; the upper zone, where NEF values are greater than 35 is a zone in which "housing shall be denied financing under the National Housing Act"; in the intermediate zone, where NEF values are between 30 and 35 "housing shall be denied financing under the National Housing Act unless adequate sound insulation is provided", and finally, the lower zone, NEF 25 to 30, in which "the provision of adequate sound insulation is recommended. Housing shall be denied financing under the National Housing Act in the upper third of this zone when the sound insulation proposed is substantially below that considered to be adequate". A rather elaborate system for choosing "adequate sound insulation" is given, based on the various room functions and exposures -- naturally the emphasis is on sealed double glazed windows and substantial doors -- a solution which is much more acceptable in Canada's climate than in Australia's.

Another interesting project at the National Research Council is being carried out by J. Piercy and Tony Embleton, on sound propagation out of doors - they have made some interesting measurements of sound propagation close to the ground, and have developed theoretical explanations for "anomalous sound absorption"; from the results obtained thus far it seems important to keep the measuring microphone well above the 1m level above ground, since for some combinations of source-receiver levels and distances, the phase-cancellation dip can occur in the 1,000 Hz band -- which of course would cause havoc with a dB(A) measurement!

It was interesting to find so many common community noise problems in the diverse parts of the world that I visited, and to find that in general everyone is coming to similar solutions; it is now a matter of refining some of the procedures and putting theory into practice. We are now at the stage when the various authorities should be encouraged to enact noise legislation based on proper acoustic standards and measuring procedures, which are reliably correlated with the average human reaction to noise.

REFERENCES:

1. Development and Compensation - Putting People First Cmnd. 5125 HMSO 1972
2. J.M. Garrelick - Review of Noise Impact Aspects of Environmental Impact Statements, Paper NN1 - presented at 84th Meeting of the Acoustical Society of America, Miami Beach, Dec. 1972
3. New Housing and Airport Noise - Central Mortgage and Housing Corporation, Ottawa (A supplement to the Site planning handbook).

NATA AND NOISE

G. W. PATTERSON

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The National Association of Testing Authorities, Australia (NATA) has recently celebrated the twenty-fifth Anniversary of its formation -- an important twenty-five years during which the organisation has grown from a collection of ideals to practical realisation with over nine hundred member laboratories throughout Australia, covering all aspects of testing.

The idea of establishing comprehensive testing facilities to meet industrial and commercial requirements had been born as far back as World War I. However, as with the development of acoustics, it took World War II to really establish the need for NATA. The volume of routine testing of munitions supplies provided by manufacturing industries began to place severe stresses on governmental establishments. A scheme for farming out testing to other "test houses" was developed which embraced one hundred and fifty laboratories at its peak. This scheme was a success; it established that industrial testing laboratories were capable of reliable operation and led directly to the formation of NATA.

The initial recommendations made to Cabinet in 1946 included proposals for the co-ordination of testing services throughout Australia and the formation of a union of testing laboratories to be known as the National Association of Testing Authorities. These laboratories were to retain their autonomy but be registered to issue endorsed test documents indicating that tests had been carried out in accordance with a procedure agreed to by members of the Association. The constitution of the Association was approved in 1946. After several tumultuous years, the Association found its feet, became firmly established, and in 1957 was incorporated as a company limited by guarantee under the provisions of the Companies Act of Victoria.

The Association is governed by a Council which grants registration to laboratories satisfying certain criteria. Some of the factors taken into consideration when establishing these criteria are the calibre of staff, suitability of equipment, calibration of equipment, accommodation, test methods and the maintenance of an adequate record system. Depending upon the capabilities of a particular laboratory, registration may be granted for one test or for a whole range of tests. An extension of registration to include other tests may be granted at any time on application to the Association, provided the stipulated criteria are satisfied. When registration is approved a laboratory may issue NATA endorsed test documents for any or all of the tests for which it is registered. The Association conducts a regular reassessment of member laboratories to ensure that a satisfactory standard of testing is maintained.

For efficiency of operation, the whole spectrum of testing is divided into the following nine fields:

- Acoustic & Vibration Measurement
- Biological Testing
- Chemical Testing
- Electrical Testing
- Heat & Temperature Measurement
- Mechanical Testing
- Metrology
- Non-destructive Testing
- Optics & Photometry

Each field is controlled by a Registration Advisory Committee which makes recommendations to Council of the criteria for registration of laboratories and assesses the compliance of applicant laboratories with these criteria. As mentioned previously the calibre of staff is of importance when assessing testing capabilities.

Experience and qualifications serve as useful guidelines here. In the absence of formal qualifications in a particular field, such as acoustics, the Association would rely on membership of a professional society, in this instance the Australian Acoustical Society, to provide a basis for assessing the calibre of staff.

The suitability and calibration of equipment is an important consideration, especially in the field of acoustical measurement where imported equipment is predominant. This equipment has to stand up to the rigours of importation and can easily arrive out of initial calibration. Once safely at the laboratory the equipment may be used for field tests and has to endure the climatic and road conditions that this country has to offer. For these reasons, great emphasis is placed by the Association on regular calibration of testing equipment. This can be a costly process and difficult to arrange at times although the number of NATA laboratories engaged in calibration work has increased significantly over the years. Laboratories are encouraged to carry out their own internal checks on equipment where appropriate both as a safeguard to themselves and as a cost-saving in that the periods between external calibrations can be increased in these cases.

Accommodation requirements are as varied as the field of acoustical measurements itself; certain tests calling for the provision of low noise level test sites, anechoic chambers, reverberation chambers, etc. In general, equipment should be housed in clean, spacious, well protected areas. An important aspect of registration is the provision of an adequate records system, ensuring that any NATA-endorsed certificate which is issued can be traced back to the original test results. This provides a safeguard to the laboratory in case of dispute arising over the test results. As indicated above, registration involves a thorough examination of many aspects of a laboratory but this is to the benefit of the laboratory and the community as a whole.

A laboratory may be registered in one or more of the nine fields of testing. However, an application in each field attracts an application fee which at the present time is $200 and an annual membership subscription of $75. Every attempt is made, both by correspondence and by visits of NATA staff officers, to ensure that a laboratory does not apply for registration until it can meet the standard set by the Association. This saves both time and money to the applicant laboratory and to the Association. On receipt of an application, an expert team of assessors visits the laboratory to assess compliance with the registration requirements for the tests involved. The assessors submit a report to the Registration Advisory Committee which, on the basis of the report, recommends to Council that either registration be granted or advises on the action required before registration can be granted. From over a thousand applicant laboratories only a few have faield to achieve registration once an application has been made.

There are many reasons why laboratories seek registration with NATA. Some get satisfaction from achieving the standard required for registration; it signifies recognition of a well-run testing laboratory. To others financial considerations are foremost. Many Government and industrial establishments recognise the reliability and consistency of tests from NATA registered laboratories, and they stipulate NATA-endorsed certificates to satisfy the testing requirements in contracts. Registration in this case has the added advantage that the laboratory has the strength and good name of the Association behind it in case of dispute.

NATA registration can help to alleviate the worries of managing a laboratory. The Association conducts a biannual assessment of member laboratories, auditing such things as calibration of equipment, laboratory records, and laboratory practices in general. This can remove some of the load from the shoulders of the officer-in-charge of the laboratory. Other laboratories are more interested in the wealth of information and contacts available to members of the Association.

NATA has laboratories registered throughout Australia and has on call assessors who are experts in all fields of testing. There is a constant feedback of information from this source, and there is dissemination of knowledge through symposia, conferences, workshops, etc., organised by the Association. Intimate contact with SAA and other organisations publishing standard test methods ensures that problems encountered by laboratories in their testing procedures can be quickly brought to the attention of the relevant organisations. For these main reasons, the Association continues to attract a large number of applications each year.

Acoustical measurement is a field of testing relatively new to the Association, the first registration being granted in 1964 to Angus & Coote Acoustics Pty. Ltd. for tests on audiometers and hearing aids. The number of registrations has grown steadily over the years, and with the increasing awareness of the impact of noise on both the environment and on hearing ability, it is to be expected that the value of NATA registration will become more apparent. Laboratories currently registered cover a range from the calibration of acoustical equipment through to sound level measurements of vehicle noise emission, and to measurement of sound insulation. During the recent visit of the Concorde to Australia, independent sound pressure level measurements were carried out by a NATA registered laboratory. In the future, one can predict that NATA registered laboratories will become involved in all facets of noise measurement throughout Australia.

With this increased emphasis on noise measurements throughout the community, the Association would be pleased to co-operate with the Acoustical Society or its members in any way it can to further the advancement of this field.

THE AUTHORS

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Mrs. Lawrence is the author of "Acoustics in Building" (Hodder and Stoughton, Melbourne, 1962), and of "Architectural Acoustics" (Elsevier, London, 1970). She returned recently from six months study leave overseas, for part of which time she was Visiting Senior Research Fellow at the Institute of Sound and Vibration Research, Southampton. She is chairman of Standards Association of Australia Technical Committee AK/5 "Community Noise", and is a member of Technical Committees AK/4 "Architectural Acoustics", and AK/6 "Aircraft Noise".

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