AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

PLANNING FOR NOISE

HYDRO MAJESTIC HOTEL
MEDLOW BATH
BLUE MOUNTAINS N.S.W.

19TH TO 21ST SEPTEMBER 1975

CONFERENCE RUN AND ORGANISED BY THE N.S.W. DIVISION

AUSTRALIAN ACOUSTICAL SOCIETY

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INDEX TO KEYNOTE PAPERS

Session 4A Industrial Noise - The External Environment
has been inserted in the appropriate place, although it was issued as separate notes

A SUMMARY produced at the end of the conference is included after Session 7A.

The program and a list of those who attended is also attached.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 2A - INDUSTRIAL NOISE - THE WORKING ENVIRONMENT

CONVENOR:

R.J. Carr,
Acoustical Consultant,
Carr & Wilkinson,
MELBOURNE.

PANEL:

Dr. Shepherd,
Medical Officer,
N.S.W. Department of Transport.

K. Keen,
Psychologist,
National Acoustic Laboratory.

P. Williams,
Engineer,
Dept. of Labour & Immigration,
SYDNEY.

A. Mather,
Technical Manager,
Planned Music (Sydney) Pty. Ltd.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 2A

INDUSTRIAL NOISE - THE WORKING ENVIRONMENT

Do sonic environments within the ranges - L 90 $<$ 85 dB(A)
L 10 $<$ 95 dB(A)
and as a peripheral interest, excess infrasonic energy effect human performance, safety, comfort, health and morale?

When should we be concerned about the effect of noise on machine performance and product quality?

In this session we set out to explore whether these effects are detrimental, neutral or facilitative. Can the effects be related in a predictive sense to intensity, character and cumulative exposure?

What response changes occur with time, group attitudes, motivation, job satisfaction and adaptability? Does intelligence quotient and task complexity effect the response? In what circumstances does the addition of sound and/or music increase the degree of arousal, performance and feeling of well being? Is there a correlation between annoyance and performance bearing in mind it is now respectable to suggest that the same noise causes different people to react differently.

What contribution (positive or negative) do other environmental factors have on response performance or well being? For example can we study the sonic environment in isolation of the visual and thermal issues? Also what benefits are obtained by controlling reverberant sound but with minimal reduction in direct sound?

In summary, this session hopes to obtain a consensus of opinion of delegates, preconceived or arrived at through discussions, as expressed by individual completion of the following questionnaires.

INDUSTRIAL NOISE - THE WORKING ENVIRONMENT

QUESTIONNAIRE IN CONNECTION WITH DELEGATES' CONSENSUS OF OPINION WITH RESPECT TO EFFECTS OF NOISE ON HUMAN PERFORMANCE ETC. AND PRODUCTION EQUIPMENT

Sound within the limits of: L 90 $<$ 85 dB(A)
L 10 $<$ 95 dB(A)

Gives rise to:-

	YES	NO	SOMETIMES
MAN			
Physiological ills (other than hearing loss)			
Psychological ills			
Inefficiency			
Danger other than loss of hearing			
Communication Problems:- Man to Man Machine to Man			
MACHINE			
Inaccuracy			
Instability			
Faulty product			
Fatigue/Malfunction			

.2 Effect and order of significance on Efficiency (E) and Wellbeing (W) of most people most of the time.

	YES		NO		SOMETIMES	
	E	W	E	W	E	W
Task Nature						
Individual menial						
" routine						
" complex						
Group menial						
" routine						
" complex						
Group attitude						
Financial Reward						
Invironmental Issues						
Controlled sound						
Poor visual						
" thermal						
Reduced reverb'n						

Notes: 1. Order of Significance is to be indicated by use of the following letters -

H - very significant

M - medium "

L - low "

2. Efficiency is to relate to the process and production whereas Wellbeing is to relate to the person.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 2B - AIR TRANSPORT NOISE

CONVENOR:

Jack Rose,
Chief Engineer,
National Acoustic Laboratories,
SYDNEY.

PANEL:

W.L.J. Bourke,
Divisional Engineer,
Qantas Airways Limited.

M. Franck,
Airport Specialist,
N.S.W. Planning & Environment Commission.

G. Douglas,
Superintendent,
N.S.W. Region,
Department of Transport Air Transport Group.

M.D. Dunn,
Principal Engineer,
Environment & Security Branch,
Department of Transport,
Airways Operations Division.

G.H. Foster,
Councillor,
Hurstville Municipal Council, and
National Sales Manager,
T.N.T. Transport System.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 2B

AIR TRANSPORT NOISE

Though there had been some public complaint about noise from aircraft in the days of petrol propellar-driven transports, concern grew rapidly with the introduction of new aircraft engines using turbo-prop, jet and fan-jet types.

The power of these new engines made it possible to design larger aircraft with better operating economies, speed and comfort so that an increasing number of people were able to use this form of transport.

As the problem grew both in magnitude and frequency, pressure was initially applied to aircraft operators but this was ineffective since they were the least equipped to cope with this unfamiliar and to them unreasonable criticism. With further growth the strain spread to all those associated with design, operation and regulation of aircraft.

Control of aircraft noise was found to require a multi-disciplinary approach since the extent of noise exposure caused by aircraft operations depends on many factors, most of which are interdependent and each factor must be fully exploited if the maximum benefit is to be achieved.

The aircraft noise situation differs significantly from other areas of community noise exposure in that:

(a) The fields of aircraft design and operation are highly technical; at all levels there are people accustomed to finding technical solutions to complex problems.

(b) The aircraft design and operating groups are also accustomed

to outlaying large amounts of money before any return can be expected.

Having recognised that insufficient was known about physical measurement of noise from aircraft or of how this noise affected people, they were prepared to begin research programs which still continue in these areas.

d) The noise sources are remarkably constant in acoustic power, frequency spectrum and directional characteristics. Once design has been fixed on the major dimensions and operating characteristics it is possible to predict noise with reasonable accuracy.

(e) Because sound propagation conditions are fairly uniform from one airport to another at close-in positions, typical of the worst affected areas, it is possible for noise tests to be repeatable with an accuracy rarely achieved in other areas of study which thus enabled the standardisation of accurate measuring systems.

(f) Accurate measuring systems enabled compilation of a data file covering the majority of operating aircraft and this, combined with a knowledge of the numbers of each type involved gave a measure of the overall problem. In other areas it is rare to be able to predict the volume or distribution of types involved from week to week or into the future.

(g) Individual situations were able to be assessed on the basis of present or predicted aircraft movements and, unlike other forms of transport, there was an already established system (air traffic control) for controlling the way the vehicles would be operated.

(h) Technology having developed to the stage whereby costs could be related to feasible benefits, the problem and its possible solutions were taken to the competent legal authority, in this case the International Civil Aviation Organisation, and legal sanctions imposed on all new designs for the categories which caused most concern. Provision was also made for future revisions of limits and extensions to other categories.

This is the scenario for successful control of noise and it has resulted in the introduction of new aircraft types which are in the order of

20dB better than they would have been if the former relationship between size and noise had continued.

Unfortunately the full effects of the improvements will not be noticed since these new quiet transports are mingled with the many designed before noise reduction technology was sufficiently advanced.

On the technological side, a law of diminishing returns now applies and we can expect little return in noise reduction for a vast outlay in funds so that other strategies such as land-usage planning are needed to make significant improvements from now on.

People working in aircraft noise reduction would be the first to admit that legal steps and financial outlays have been undertaken without completion of research into:

(a) subjective response to aircraft noise
(b) noise measurement methods which are accurate, repeatable and representative of community exposure
(c) techniques for reducing aircraft engine noise
(d) methods for determining compatible land usage
(E) how aircraft can best be flown to preserve the present excellent safety records while minimising community noise exposure.

In this, aircraft noise differs from no other area of noise exposure and in fact is well ahead of most. Indeed the first extensions to include different categories of aircraft combined with revisions of measurement methods and licensing limits is taking place already.

This means that the initial steps having been successful, the next advance is on the way and proof of this success is available to all who are prepared to stand beneath flight paths and listen to the noise coming from the new generation of large wide-bodies high-bypass fan-jet aircraft relative to the small jets of previous years.

The aircraft noise field is thus the yardstick by which other fields of noise control can be compared for their effectiveness but it

would be foolish for any of those associated with this field to become complacent since the standards of community acceptance are forever changing, and we can be sure that the future trends will always be toward reduced noise.

Many in the industry feel that aircraft noise has received much more than its fair share of attention in relation to other forms of community noise exposure but this session will emphasise that they should not forget that the air transport field has also benefited greatly, relative to other forms of transport, by the interest it arouses in the media and the population at large.

The problems of noise in the field of air transport will not conveniently fly away.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 3A - INDUSTRIAL NOISE - NOISE AND HEARING

CONVENOR:

Horrie Weston,
Division of Occupational Health and
Radiation Control,
Health Commission of N.S.W.,
LIDCOMBE.

PANEL:

Malcolm Evans,
Chief Engineer,
A.N.I. Aust. Pty. Ltd.,
LIDCOMBE.

Jack Sponberg,
Amalgamated Metal Workers' Union,
N.S.W. State Office,
SYDNEY.

Louis Challis,
L.A. Challis & Associates,
Acoustical Consultants,
SYDNEY.

Bert Burrows,
Chief Engineer,
John Lysaght (Aust.) Ltd.
PORT KEMBLA.

Peter Kotulski,
Division of Occupational Health and
Radiation Control,
Health Commission of N.S.W.,
LIDCOMBE.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 3A

INDUSTRIAL NOISE - NOISE & HEARING

Noise induced deafness is one of the most serious and most widespread hazards in modern industry. There are many difficulties in the total control for many reasons, including the wide variety of industries, the cost of reduction, the insidious onset of noise induced deafness and the frequent need to use personal protective equipment.

Statistics, as shown in the appendix, provide a measure of the problem in respect to industry in terms of the numbers of people and amounts of money involved in compensation payments. These figures have already risen to alarming proportions and it is significant that, in the year ended 30 June 1973, (the latest figures available) the payments without awards exceeded those awarded by the Commission. It can be assumed that Insurance Companies are now very aware that noise induced deafness is prevalent and this in noisy industries most claims are valid, so that settlements are made without contesting in court.

It is not possible to measure the cost to the occupationally deaf person who can no longer enjoy a conversation with his family, or with his friends in the club.

How does noise compare now and how will it compare in future with other management problems? In general, the concern for employee welfare and the cost of compensation has not motivated managements to take preventitive action and some managements appear to be more conscious of avoiding compensation payments than of preventing deafness. On the other hand are unions fully aware of the likely social disability of noise induced deafness and their responsibilities in this regard, or are they interested in payments of one kind or another rather than prevention of deafness? Do unions plan to educate their members and to take an interest in noise?

In future, unions, motivated towards prevention rather than compensation, might well exert pressure on employers to treat the matter as urgent. In addition, the general apathy of employers clearly indicates a need for legislation. In New South Wales draft regulations are being prepared for implementation under the Factories and Shops Act.

Standardisation of measuring equipment and procedures is important to provide a common language, consistent action and a method of comparison of machines. An Australian Standard has been prepared for Hearing Protective Devices. Standards are being prepared for Hearing Conservation and for a Method of Measurement of Noise and Estimation of Noise Exposure from Agricultural Tractors and Earthmoving Machinery. In addition, standards are required for a whole range of machines so that users can, within reason, choose the quietest machine available and Governments can legislate to reduce noise at source.

Hearing conservation is a human problem in which individuals must be involved. A successful programme requires communication between the various disciplines, communication with employees at all levels and training employees in their roles in the programme. Do managements consult with employees' representatives in formulating policy and do they inform them on their policy in respect to hearing conservation?

The panel will discuss present and future steps to prevent noise induced deafness, including the use of noise emission specifications when buying new equipment, the feasibility of noise reduction with existing industries, or reduction of noise exposure by administrative control, the determination of noise exposure, the inconsistencies in determining noise exposures in many work situations and guidelines for future industrial planning.

No new factory should be designed without knowing the noise level to which employees will be exposed. Legislation should provide that if the exposure is likely to exceed 85 dB(A) for 8 hours, or the equivalent on an equal energy concept, the employer should be prepared to demonstrate why it cannot be lower.

Reduction of noise is the major factor. Ideally legislation should require the reduction of noise exposure to a prescribed figure designed to protect the majority of people. It is reasonable to prescribe a lower noise exposure

for new installations than for an existing installation. The National Health and Medical Research Council model regulations, published in November 1973, and at present under revision, have recommended an initial noise dose of 1. (equivalent to 90 dB(A) for 8 hours), for existing premises with reduction to 0.33, (equivalent to 85 dB(A) for 8 hours) after a period of 5 years and 0.33 (85 dB(A)) for all new premises.

In my opinion, realistic legislation must provide for exemptions, but prior to an exemption, the employer should provide a statement as to why he cannot procure new equipment meeting a specified figure, reduce existing equipment to within prescribed exposures and what alternative steps he proposes to take to protect the employees. There should be a general statutory obligation on employers to consult with employees on control measures and protection programmes. Should not legislation ensure this by requiring a copy of exemption statements to be supplied to employee representatives?

The use of hearing protection is difficult to enforce, there may be some valid objections and before compulsion the employer should adequately train the employee. When the use of hearing protection presents difficulties, or when employees raise objections, employers should be required to provide statements to the appropriate legislative authority and such statements should be available to employees or their representatives.

The value of audiometry in the hearing protection programme is controversial, but it is essential for evaluating the success of the programme and as an indicator for future action.

The control of occupational noise is complex and the enforcement of legislation could be cumbersome. The responsibility for control should be shared by those who create the risk and those who work with it. The concept of self regulation with simplified employer/employee consultation and voluntary codes of practice might well provide a flexible and practical means of control in the future.

Wise managements will discard "wait and see" attitudes, use the guidelines which are already available and start their "lead in" periods now in preparation for contemplated legislation.

N.S.W. WORKERS' COMPENSATION CLAIMS - NOISE INDUCED DEAFNESS - YEAR ENDED 30 JUNE

	1970		1971		1972		1973	
	No.	$	No.	$	No.	$	No.	$
Awarded by Workers' Compensation Commission	1160	750,070	1598	997,171	1415	830,600	1131	789,388
Payments without Awards	1946	315,088	2031	272,476	1702	293,544	2558	952,745
Legal Costs		135,443		178,438		167,690		136,740
Investigation of Claim Costs						31,341		29,625
TOTAL	3106	1,200,601	3629	1,448,085	3117	1,323,175	3689	1,908,498

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 3B - LAND TRANSPORT NOISE

CONVENOR:

Anita Lawrence,
Associate Professor,
School of Architecture,
University of N.S.W.

PANEL:

Neil Neilsen,
Urban Planner.

John Latham,
Dept. of Transport,
Surface Transport Group,
CANBERRA.

Graeme Pockner,
Engineer,
B.P. Australia Limited,
MELBOURNE.

Marion Burgess,
Senior Tutor,
School of Architecture,
University of N.S.W.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 3B

LAND TRANSPORT NOISE

INTRODUCTION

In this conference it is intended that we should take stock of the current noise situation and attempt to predict the acoustic consequences of future actions. The last few years have seen a radical change in the former tacit acceptance by communities of the "bad" with the "good" resulting from "progress" - a new accountability with respect to environmental quality is now required from the protagonists of any major new development.

Since the invention of the wheel, land transportation in its many forms has played an increasingly important role in community life. Our nuclear society turns out to be interdependent with global society and although we are now in the midst of the present need to move large numbers of people about physically, there will be no decrease in the need to transport food, raw materials, made-up goods and services (unless we go back to a subsistence existence). In all but a few exceptional cases, some, if not all of the journey will be made by a land-based vehicle.

LAND TRANSPORTATION SYSTEMS:

Fig. 1 shows the main forms of land transportation now available, and forseeable in the near future. These forms fall into two main categories - rail-bound systems and road systems - although it is true that there are various projected systems which combine both modes of transportation. Rail transport, because of the large capital cost

involved is now mainly in the public domain - with regard to ownership and usage. Road transport has a dual role, although the capital expenditure is by the State and some of the vehicles are also publicly owned and used, the vast majority of individual vehicles are in private use.

Of the two modes of land transportation, road and rail, the former presents the greater noise problem - in fact, road traffic noise constitutes by far the greatest external noise problem in urban communities (aircraft included). The last thirty years has seen a great increase in the ownership and use of private cars for personal transportation, and also in the use of road vehicles for goods transport. Now there is a growing interest in the improvement of public transport systems so that people may be wooed away from their private cars; the diversion of freight back to the railways is also advocated by some. How realistic are these proposals? In earlier times, compact settlements grew up along the routes and junctions of public transport (either rail or coach). It was not until personal vehicles became widely available that the so-called urban sprawl developed. People are no longer restricted to living within walking distance of their food supplies, their employment or general community facilities, or even of the nearest pick-up point for public transport. Thus, apart from the convenience and independence associated with the use of a private car, low population densities particularly in middle and outer suburbs make viable competition from existing modes of public transport extremely unlikely. For freight, because of high labour costs, transhipment from one mode to another (e.g. road-rail-road or road-ship-road) has tended to be replaced by the use of road vehicles for the whole journey - for a wide range of commodities. (High labour costs have also stimulated the use of larger vehicles able to carry increased payloads.)

LAND TRANSPORT NOISE:

The great difference between the noise annoyance caused by road and rail vehicles is that whereas the latter are confined to specific routes, road vehicles spread into any convenient road space and traffic

patterns may literally change overnight. (It is interesting to note the reaction of road commuters when faced with a new set of traffic lights at an intersection - immediately the right-hand-turn traffic into the preceding streets increases and through traffic intrudes in a street previously used only by local vehicles; this driver behaviour can only be prevented by traffic management.) Existing railways and tramways tend to be self-sorting as far as noise-sensitive people are concerned, they either do not choose to live or work nearby or they move away if they are annoyed. However when major changes are made to railway systems, either by building new surface tracks or by introducing markedly different vehicles (e.g. high speed trains) considerable noise nuisance is likely to result.

It is difficult to state exactly what constitute acceptable noise levels from road and rail traffic - certainly very little research has been carried out with respect to railway noise until recently. Several surveys have been carried out to determine peoples' reactions to road traffic noise, and the main point of agreement is that individuals react in many different ways! Although it is not the only important factor, the level of the noise heard does correlate with the disturbance caused. Traffic noise as heard near a road is characterised by continual changes of level, the peaks occurring as an individual vehicle passes the observation point. When the number of vehicles passing is small, the lowest levels will be those of the general community noise in the area; as the traffic flow rate increases, the noise of each vehicle is combined with that of others nearby and the lowest levels increase; however, the peak levels will not necessarily be higher than in the case of flow rates. Various units have been used to describe fluctuating traffic noise levels - currently the most useful of these units are the L_{10} level (the level, in dB(A) exceeded for 10% of the time period) and L_{eq} (the equivalent energy level, in dB(A)). The values of L_{10} and L_{eq} are directly related to the flow rate (vehicles per hour). At present, the different levels of noise emitted by individual vehicles is included in traffic noise prediction methods rather crudely - a factor is added according to the percentage of "heavy" vehicles in the traffic

mix. This does not take into account the noisy car or the quiet heavy vehicle. In the case of urban traffic road speed does not seem to be an important factor in noise emission - at normal urban driving speeds, noise emission is directly related to engine speed and is thus highest when a vehicle is accelerated through its gears.

Some conservationists have strongly resisted the construction of new freeways in Australian cities. They are following overseas trends, and it may be worthwhile to consider the validity of their arguments from the viewpoint of noise emission. Firstly, it must be stated that there are very few kilometres of genuine freeway open in Australia, and although no-one in the world would want to end up with another Los Angeles situation, we have not even got to first base in this respect. In overseas countries, where there is a well-developed freeway system, most of the through traffic appears to choose to use it in preference to roads with on-grade intersections, poor alignments, steep grades, etc. In particular, large commercial vehicles are diverted from local streets for most of their journeys. In ordinary urban traffic it is necessary to halve the traffic flow to decrease the noise level by about 3 dB(A) - a barely noticeable improvement, but if the percentage of heavy commercial vehicles in the mix is halved the L_{10} levels may be decreased by about 10 dB(A) - a subjective halving of the loudness. It is true that a considerable amount of noise is radiated from a busy freeway, carrying perhaps 4,000 to 5,000 vehicles per hour, but it is also true that the same number of vehicles spread over ordinary urban roads are likely to affect more people. A freeway also has something in common with a railway line, i.e. greater predictability of routing and of noise level. Thus, if for example, buildings are to be specially constructed to attenuate traffic noise levels to acceptable levels inside, they may be clearly identified and the problem more readily contained.

ECONOMICS ON LAND TRANSPORT NOISE REDUCTION:

Alexandre and Barde (1) discuss the growing number of uncompensated social costs accompanying economic activities, which activities had

previously been assumed to have a direct monetary counterpart stemming from voluntary exchange. They suggest that the right to make a noise should be subject to a charge, based on the social costs of that noise, but they admit that it is difficult to establish these costs directly. However, a tax could be introduced, say at a rate which doubled for each 3 dB(A) increase in noise emission above a certain level; (which tax they hasten to add should be applied directly to noise abatement, not to swell the government's coffers). They point out that taxation on fuel and cylinder capacity as at present applied has a negative effect on noise abatement, since manufacturers are now producing lighter cars of smaller cylinder capacity but with higher compression ratios and engine speeds to maintain their performance, thus considerable increasing their noisiness.

All new road vehicles in Australia must now comply with Australian Design Rule 28, which sets limits (according to vehicle type) on noise emission during a standard acceleration test. The test method and limits set are similar to those in use in Europe where "80% of the types (of vehicles in production) satisfied the 1974 limits a decade ago" (2). Thus it cannot be expected that there will be a dramatic reduction in traffic noise through the restrictions on individual vehicle noise emission resulting from ADR 28. (The validity of the test method is another contentious subject.) For one make of private car it has been estimated that each 1 dB(A) of noise reduction adds about 1% to the total cost of the vehicle, and for certain commercial vehicles not only are the costs high (owing to the small number of vehicles of each type produced) but the technology for significant noise reduction is only recently becoming available.

In Britain remedial action (which may include the payment of compensation) is required where a new or altered road built since October 1972 has caused an increase of 1 dB(A) (above 68 dB(A) in the 18-hour L_{10} noise level. The remedial action includes the provision of double windows and mechanical ventilation. Vulkan (3) has estimated that the cost of urban road building could be increased by 15% to 20% if all noise

reduction aspects are implemented.

In Australia there is no compensation scheme for the victim of increased road noises. It is left to the individual to bear the costs of improving the attenuation of his dwelling or business premises - and costs for remedial action are currently of the order of $2000 per room (allowing for the provision of a room air-conditioner in place of natural ventilation). It is not surprising that there are few people prepared, or able, to reduce traffic noise intrusion on an individual basis.

With regard to train noise, the Japanese have had considerable experience with the environmental disadvantages of high speed trains and their Environment Agency is now establishing noise and vibration standards. It is anticipated that not only will changes have to be made to rolling stock, track and substructures, but it may be necessary to alienate from residential use affected land either side of the tracks - in a country so short of land as Japan this is indeed a costly solution.

CONCLUSION:

Since its invention, the internal combusion engine has held unchallenged leadership as the motive force behind road transportation. However, it is now coming under increasing criticism because of its gaseous and noise emissions. More recently, the politics of world energy supply have also shown the vulnerability of communities which depend almost exclusively on petrol and diesel fueled engines for land transportation. It may be that electric batteries or solar energy cells will provide the motive power for road transportation in the not too distant future. In this case, our present problems of noise and air pollution resulting from the use of road vehicles will be dramatically reduced. Whether a country of Australia's size and population densities will be able to replace diesel-electric locomotives with electric ones for long distance haulage is another question, and it is unlikely that it will be resolved on account of possible noise reduction benefits.

In this Session it is hoped that a wide range of viewpoints will be expressed both on the present state of noise emission from land transportation vehicles and on the environmental consequences of the alternatives which face us in the future. Individuals differ widely in their reactions to noise, and care must be taken to balance the costs and benefits of noise reduction with societies' other needs which must be paid for out of their (finite) resources. However, many people in developed countries are showing increased concern in the quality of their lives and although many seemingly irreversible disbenefits have been inflicted upon our world in the name of progress, silence is fortunately one quality that need not be irretrievable.

REFERENCES:

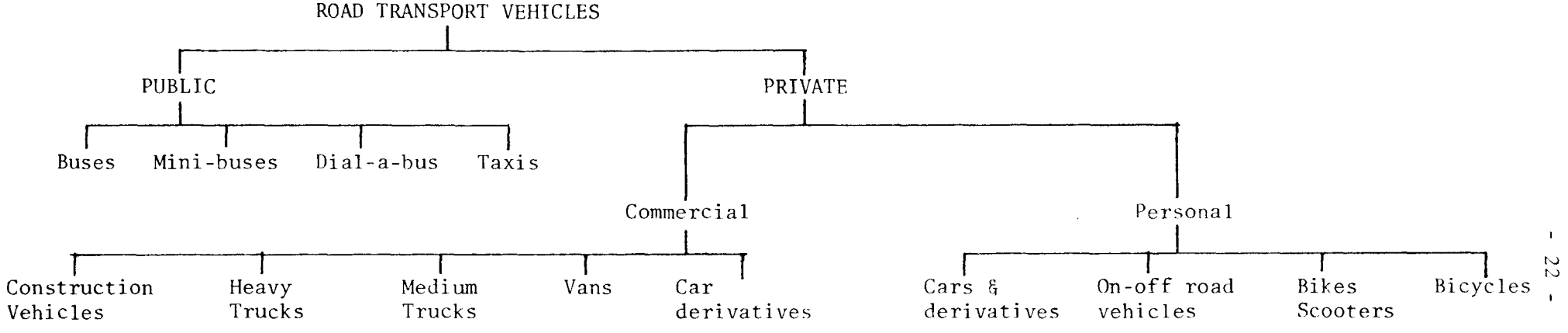
Symposium on Noise in Transportation, University of Southampton, 1974

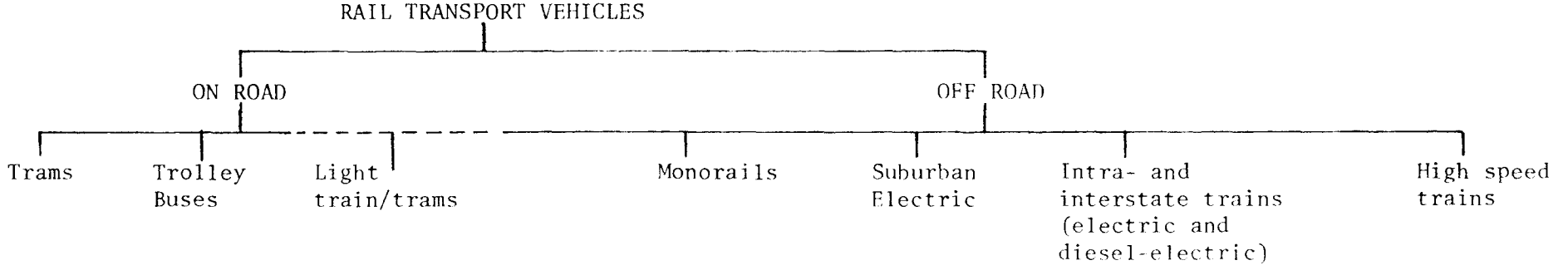
(1) Alexandre, A. & Barde, J-P "Motor Vehicle Noise Abatement Through Economic Incentives".

(2) Macmillan, R.H. "The Control of Noise from Surface Transport".

(3) Vulkan, G.H. "Developments in Urban Planning Against Noise".

FIG. 1 LAND TRANSPORT VEHICLES





AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 4A - INDUSTRIAL NOISE - THE EXTERNAL ENVIRONMENT

CONVENOR:

Jillian Hulme,
Senior Noise Control Officer,
Environment Protection Authority,
MELBOURNE.

PANEL:

Doug Growcott,
Carr & Wilkinson,
Acoustical Consultants,
MELBOURNE.

John Davis,
Environment Protection Authority,
MELBOURNE.

John Pettifer,
Repco Pty. Ltd.,
MELBOURNE.

Peter Gardner,
Vipac Laboratories Pty. Limited,
MELBOURNE.

George Chenco,
Australian Paper Manufacturers Ltd.,
MELBOURNE.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 4A

INDUSTRIAL NOISE - THE EXTERNAL ENVIRONMENT

Industrial noise if a major contributor to the overall noise climate in the community environment. While not as all-pervading as transportation noise, it adversely affects localised areas in both the city and the country. Of all noise complaints received by the Victorian Environment Protection Authority, more than half are related to industrial noise problems.

To outline the extent of the problem, three main categories can be considered:

A. In inner suburban areas of large cities, many old established industries exist in close proximity to high density housing. In some cases, noise control measures were not considered in the original design of the industrial premises. Often problems have been aggravated by the updating of old or installation of new equipment, or the introduction of new processes.

B. In developing outer suburbs, industrial premises which were once situated in open areas on the outskirts of cities have been enveloped by residential development. Due to uncoordinated development planning, housing is often built right up to industrial boundaries.

C. In country areas decentralization of industry may cause problems. In areas in or near quiet country towns ambient levels can be far lower than those existing in inner, or outer suburban areas. As a result, the community may be sensitive to noise levels which would be acceptable elesewhere.

Many factors have contributed to the present situation whereby industrial

and residential premises exist side by side in a manner which is detrimental to both. For the future, a positive approach must be taken to ensure that those factors do not cause the generation of further noise problems. The solution may lie in a coordinated planning scheme involving town planners, industrialists, technical experts, residents and government bodies.

It is hoped that during Session 4A ideas will be raised on the following topics either by panellists or delegates:

1. Noisy Industries and Equipment

1.1 The major types of noisy equipment
1.2 The various diverse types of noisy industries
1.3 Noise in relation to the size of industrial premises
1.4 Where noisy industries occur - the extent of the problems
1.5 Selection fo new equipment/processes
1.6 Planning and how it can help.

2. Regulations

2.1 Should regulations control premises or individual pieces of equipment or both?
2.2 Target noise levels for the future
2.3 Difficulties in watertight measurement specifications
2.4 Enforcement
2.5 Can regulations be useful in the planning sphere?

3. Zoning

3.1 Usefulness of the concept of zoning
3.2 Based on the industrialist's or resident's point of view?
3.3 Definition of Zones
3.4 Buffer Zones
3.5 Concept of Noise Abatement Zones
3.6 Zoning as an aid to planning

4. Noise Contours

4.1 What noise contours are

4.2 Their use in determination of the noise output from industrial premises

4.3 Planning and noise contours

5. Planning New Plant

5.1 Noise aspects to be considered

5.1.1 Proximity or likely proximity of housing

5.1.2 Topography

5.1.3 Positioning of individual pieces of equipment

5.1.4 Contruction of building

5.1.5 Choice of equipment

5.2 Psychological aspects and Public Relations

5.3 Cost/Benefit

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 4B - WATER TRANSPORT NOISE

CONVENOR:

Ian Lawrence,
A.C.I. Fibreglass,
SYDNEY.

PANEL:

Louis Challis,
L.A. Challis & Associates,
Acoustical Consultants,
SYDNEY.

John Hawkless,
Maritime Services Board,
SYDNEY.

Lee Kenna,
National Acoustic Laboratories,
SYDNEY.

Dick Langford,
Dept. of Environment,
HOBART.

David Wharington,
Dept. of Transport,
MELBOURNE.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 4B

WATER TRANSPORT NOISE

KEYNOTE PAPER

It has long been recognised that the number one noise problem today is transportation noise. This is the natural result of an increasingly mobile and affluent society - a society that demands, and for the most part gets its mobility requirements from the transport of goods and services and from the transport of people, either for logistical purposes or for pleasure and recreation.

Like noise problems in other areas involving transportation, those in thefield of water transportation generally emanate from mechanical noise sources. Noise sources such as engine and exhaust, power generators and mechanical ventilators are the ones that seem most obvious, but these form only a part of the problem. Other sources such as wharf construction equipment, cargo handling gear and noise from recreational activities are often more significant in that more people are affected.

The State of New South Wales is by far the most advanced of all Australian areas in the legislation to restrict noise from transportation sources. Other states and Australian Territories could do well to look closely at the state of the art in New South Wales, and together with more work in the fields of zoning and standardization, they could come up with even better solutions to the problem.

Current legislation in this State provides for the Regulations under the Maritime Services Act to be applied by the Maritime Services Board in respect of any noise nuisance in 'any port or inland navigable waterway' in the State. Such sources as noisy activity aboard

pleasure craft, mechanical noise from ship repair facilities, noise from racing power boats as well as those mentioned earlier are all controllable by officers of the Maritime Services Board.

Two main areas allied to the legislative aspects remain incomplete, and these involve the standardization of Measurement Technique and the noise zoning of areas covered by the Maritime Services Act.

Standardization of Measurement Technique, is for obvious reasons all important in ensuring that reported data can be correlated. This in turn will ease the burden of legality when litigation or other means of recourse are invoked. It may also ensure that criteria are convertible across the nation, thereby solving operationsl problems for interstate and overseas shipping lines.

Noise Zoning of areas around ports, harbours and inland waterways is equally essential, in that restrictions on noise levels bear proper relationship to such factors as historical or traditional useage, essentiality of services and proximity to residential areas. Additionally and perhaps more importantly, noise zoning would essentially tie in with background noise which is time dependant.

It is recognised that the ultimate aim in Noise Control Legislation can only hope to satisfy most of the people most of the time in respect of noise induced annoyance. There will always be cases where some people, for some of the time, will have to accept a certain amount of annoyance because they choose to live or work in certain areas. However in general the effects of legislation will be to lower traditional noise levels through inducement to innovation at all levels. Legislation will also have another effect, that being to reduce the incidence and magnitude of noise-induced hearing loss.

This directs our attention from the community to the individual - the person who works in a Maritime vocation.

Noise levels have always been high on board steel hulled ships, due to the transmissibility and resonance characteristics of the hull and

bulkhead configurations; and to the difficulty in isolating the engine and transmission areas.

However, those cases are not dissimilar to other more common Engineering Noise Control problems and can be overcome with adequate forethought at the conceptual stages of design. Engine type and design, exhaust noise control devices and new techniques in vibration isolation can all help here, but what about the occupational noise levels in existing vessels?

Usually all that can be done is to apply the accepted occupational noise exposure units and to provide acoustical 'havens' for off duty personnel. Although many countries and institutions have their own criteria for noise levels by zone on board ship, no attempt has been made to standardize this throughout the world. This is an area that could well deserve further attention.

What of the future? To be truly effective, noise regulations should be realistic and be able to meet targets, they should be written to relieve a current bad situation. They should be graded to provide increasing effectiveness, and they should ensure that in the long term, planning stimulates the development of new techniques. To accomplish this, these must be unified standards for measurement and interpretation, unified criteria in occupational environments and a satisfactory zoning and land useage regulation. To tie all these into a cohesive code will require constant effort from Governments at all levels.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 5A - BUSINESS NOISE - OFFICES AND SHOPS

CONVENOR:

Dr. Victor Mason,
Research Fellow,
Mechanical Engineering Department,
University of Queensland,
BRISBANE.

CO-CONVENOR:

Richarg Heggie,
Acoustical Consultant,
James A. Madden Associates Pty. Ltd.,
NORTH SYDNEY.

PANEL:

Norman Holt,
Department of Psychology,
University of Sydney.

Peter R. Knowland,
Acoustical Consultant,
Peter R. Knowland and Associates,
NORTH SYDNEY.

David Perkins,
Co-ordinator General's Department,
BRISBANE.

Ron Rumble,
Acoustical Consultant,
Louis A. Challis & Associates,
BRISBANE.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 5A

BUSINESS NOISE - OFFICES AND SHOPS

"The most significant business improvement," said the manager of Icecreamland, "was the jukebox. It really pulls the kids in from the street."

Not all examples are as blatant as this, however retailers and other commercial enterprises have certainly not been hesitant or unimaginative in competing for our attention through our ability to hear. The faculty of hearing is probably the most important channel for social learning and influence, and it is therefore no wonder that it should be used to commercial advantage so extensively.

Anyone who walks through a modern shopping centre and carefully listens to all the sounds present will realise what a constant and determined barrage is directed at us. The approach may be a subtle setting of mood with appropriate music (like the example above!) or perhaps the more 'informative' onslaught of the gadget demonstrator in a department store. It may be a pop album playing in the record department (discordantly intermingling with the relaxing sounds of the store's background music system), an announcement of the five-minute bargain specials under the flashing red lamp, or a hi-fi system demonstrating its ability to recreate an orchestral concert.

In any case, these aural "attention grabbers" are a significant part of the acoustic environment in large public shopping areas. As clever as we are however, it is a psychoacoustical fact that we can usually pay attention to only one message or stimulus at a time, and all other sounds, informative though they may be, tend to merge into an unintelligible background noise. This effect is particularly reinforced by the reverberation in large shopping malls and stores.

This background noise, along with that of conversation, traffic,

pedestrians and air conditioning, etc., generally creates the subjective impression that busy retail shopping areas are "noisy" places. But conversely, "noisy" places are usually 'busy' places, and this may be the exact impression that large retail stores and supermarkets wish to create in order to encourage customers to buy products!

The range of possible acoustical situations in areas open to the public is quite complex and there are no comprehensive criteria applicable to all commercial areas. The ideal acoustical environment in a particular area is very dependent on the commercial function of that area. In most cases this ideal situation considerably exceeds the minimum functional requirements necessary to the particular commercial activity - e.g. conversation between customer and salesperson.

A fine jewelry store or an exclusive fashion salon for example, would probably benefit from low levels of intrusive noise (traffic, pedestrians etc.), an appropriate level of airconditioning noise to provide conversational privacy, and a background music system to create an acoustical 'atmosphere' in keeping with the activity and clientele of the store. The floors could be carpeted to reduce footfall noise, and reverberation minimised to ensure an appropriate degree of intimacy and 'exclusiveness'.

The areas open to the public in shopping areas obviously have particular acoustical features and requirements that differ from those of the administrative offices in shops and other businesses. Many of the basic requirements however, are common to shops and offices.

The prime requirements in all these spaces are usually good speech communication, an adequate degree of conversational privacy, a low level of intrusive noise, and a low level, broadband background noise that is appropriate to the tasks or activities performed by the occupants.

Acousticians presently have the basic information and techniques

necessary to deal with these requirements (in theory, at least".). Interference with speech communication has been thoroughly researchec and recommended loudness levels and spectrum shapes for background masking noise to ensure conversational privacy have been established. As described below however, some further refinement of the methods for specifying the level and character (dB(A) and NR) of the background noise may be possible.

The theory and practical design of open plan office spaces are quite well known. Design techniques are available to ensure that the ventilating system will provide an appropriate degree of background masking noise, or alternatively, electronic sound conditioning or background music can perform the same function.

What then are the present problems associated with the acoustical environment in shops and offices? Are existing noise levels generally appropriate? What levels should be considered acceptable? Do we, in fact, have all the necessary techniques for measurement, rating and control?

Although we appear to have most of the fundamental techniques, perhaps there are inadequacies in the application of those techniques during the critical planning phases of commercial development. Do we require additional standardised codes of practice and test methods to clearly establish design criteria and procedures for measuring and rating commercial noise?

What part should legislation or zoning regulations play in limiting acoustic interference between separate commercial areas requiring quite different environments? Is the acoustic deluge that pours from the entrances of some stores onto unsuspecting pedestrians justifiable, or should it be considered an invasion of privacy, and restricted appropriately?

Some answers to these questions can be obtained quite easily. It is most unlikely that the noise level in offices and shops is great enough for long periods of time to cause a deafness problem. There is however

the possibility that a continuous background noise or music system could affect peoples' work performance and "get on their nerves". Alternatively "too quiet" an environment could have an equally detrimental effect. For each type of activity there ought to be a generally acceptable background noise environment. Determining that level is the job for research acousticians and psychologists while acoustic consultants have the unenviable job of trying to design the required features and characteristics into the building.

Units of noise measurements are available to meet some of the needs outlined above. The Speech Interference Level (SIL) is a relatively simple and practical unit designed specifically to indicate the background noise levels which allow conversation to take place with varying degrees of ease or difficulty. This automatically means that background noise levels must be specified and controlled using a noise unit such as Noise Rating (NR) curves or perhaps the (A) weighted noise level. At first sight there could be some incompatability between units such as the NR value and the SIL because the former puts limits on all frequency bands whereas the SIL only considers three octave bands. The SIL was developed for an aircraft noise environment so that the SIL should be used where the background noise is relatively constant and has a smooth broadband spectrum.

Some typical noise readings in places open to the public (e.g. shops and banks) and in places where machinery of some sort (e.g. computers, ledger machines and other accounting or data processing machines) are given in the table. In most cases, a raised voice would be required to hold a conversation. In the public places, most of the noise comes from the people themselves due to talking and walking noise (foot fall on hard floors). This is illustrated by the noise increase in a large shopping centre between early morning (main audible hum) and midday with many more people around, (the main audible noise was unintelligible speech noise). The spectrum of the noise during the busier shopping period, peaked at surprisingly high frequencies. The NR values were controlled by the levels in the 1kHz band in most instances. However, the loudest noises shown in the table were all produced by machinery of some type and mainly by machines with an impact type of operation, e.g.

ledger machines, printers etc. Hence there is still a need for noise reduction to be designed into machines of this type.

Noise Unit	Banks	Shops (early morning)	Shops (busy, midday)	Accounting Machines	Computer Room
NR	55-75	55-65	65-70	75-80	60-80
SIL	45-70	56-62	62-67		60-75
dB(A)	60-80	55-65	65-70		65-80

The noise of the accounting and data processing machines given above was also great enough to cause an adverse reaction from the people working in those areas. However, there appears to be little published information on the ability of noise to produce poor work performance, irritability, head-aches or other reactions of this type, particularly when the noise levels are in the range shown in the above table. At levels above 90 dB(A), noise effects on work performance have been demonstrated but those levels would have been considered unsatisfactory on other grounds. It is very difficult even to design experiments in this area because job satisfaction can have a major effect as can the fact that someone is taking an interest in the work task being performed while the experiment is in progress. Nevertheless, it is an area that ought to concern acousticians and consequently it would appear that further investigations are required.

What effects do commercial centres have on the surrounding community? The problem is mainly concerned with the vehicular traffic that commercial centres attract and the noise produced by those vehicles. This problem is exacerbated if the vehicle movements continue into the evening or night.

Air conditioning plant and refrigeration equipment can also produce significant noise outside a building and in many cases this equipment runs all night. These problems are largely zoning problems which are made more difficult if residential areas are adjacent to the commercial

zone. In this later case the Australian standard A.S.1055 "Noise Assessment in Residential Areas" is available as a guide.

Within the building, the control of the noise environment is complicated by financial constraints and space and layout requirements. In particular the change from solid, full height walls to movable, light-weight screens and open plan offices has caused some problems, although potentially the materials and techniques are available to enable the consultant to achieve a satisfying acoustical environment.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 5B - RESIDENTIAL NOISE - THE INDOOR ENVIRONMENT

CONVENOR:

Rod Satory,
Acoustical Consultant,
WELLINGTON. NEW ZEALAND

PANEL:

Prof. D.C. Stevenson,
Head of Department of Mechanical Engineering,
University of Canterbury,
CHRISTCHURCH. NEW ZEALAND

reducing the problems they have already created, we must attempt to plan for minimal future impact.

The avenues available for control of present or future noise may be briefly reviewed.

1. On the one hand legislators at various levels may fix arbitrary limits on noise radiation, after due consideration of what may with social justice, technical feasibility and economic buoyancy, be reasonable expected from each of the other possible avenues described below. Legislation may for example limit noise power emission from individual items of recreational equipment, or limit the sound pressure levels at the boundaries of the premises concerned. It may instead, or in addition, put limits on the times of day or week in which such noises may be emitted. Or it may invoke compulsory minimum usage of the avenues below; for example compulsory adherance to recommendations from town planners concerning permitted zones for establishment of recreational facilities; or compulsory provision of specific standards of building construction estimated to reduce transmission of noise from inside to out, or room to room.

   The onus of "legislation" may sometimes be passed on from the public body to the private body; e.g. a simple government law limiting sound levels at property boundaries might spawn a club "rule" limiting sound power output from sporting vehicles, to avoid the cost of moving the arena to a less noise-sensitive zone. It may not be so easy for a "big brother" government to enforce hearing conservation rules on private property however.

2. The "other avenues" referred to are all means of attempting to achieve the set goal of noise abatement, set sometimes by State legislation, sometimes by a decision considered just by Court consideration of an individual case, sometimes by local councils

subject to unpredictable effects of local politics and lobbying by pressure groups. As pointed out above, the legislation may itself have specifically called up the use of some of the following:

(i) Reduction of noise at the source. Only feasible for mechanized pastimes.

(ii) Restriction of the permitted hours of operation.

(iii) Siting the recreational venue in isolation from noise sensitive areas. Promoters are understandably wary of this apparent solution, through lack of confidence in the permanence of declared zoning intentions by governments.

(iv) Enclosure or screening of the venue is feasible for some recreational facilities.

(v) Provision of a steady, acceptable masking noise can reduce the disturbance caused by activities, particularly those with widely fluctuating levels of noise output, at night when the natural ambient level is low.

The control of Sporting, Recreational and Entertainment noise, is a complex trade-off between social, economic, psychological and health considerations. If legislation for noise control, town planning, and land usage, are to simultaneously act for the maximum common weal and social justice, they should be drafted and conceived in an atmosphere of consultation between legislators, town planners, representatives of both the recreation-refreshed and the noise aggrieved minorities, and the acoustical technologists who may be called on to implement the goals they all decide on by consensus.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 6B - RESIDENTIAL NOISE II - THE OUTDOOR ENVIRONMENT

CONVENOR:

Dr. Carolyn Mather,
Investigating Architect,
Public Works Department,
PERTH.

PANEL:

Roy Caruth,
Noise Officer,
Medical & Public Health Department,
PERTH.

Brian Gray,
Chief Engineer,
Sandovers O'Connor,
PERTH.

Dick Langford,
Noise Control Officer,
Department of the Environment,
HOBART.

Bruce Penkethman,
Chief Health Surveyor,
City of Perth.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 6B

RESIDENTIAL NOISE II - THE OUTDOOR ENVIRONMENT

Noises that adversely affect the outdoor residential environment are numerous and can include those emitted by raucous parrots, excited cats, convivial neighbours and disbanded congregations leaving church. However, some sources appear to generate a far greater number of complaints than others; these include domestic air conditioning units and lawn mowers, licensed premises, practising musicians, barking dogs and chain saws. The panel shall discuss various aspects of these, and other sources, including the extent of the problem(s) they create and what has been done, and may be possible to do, to minimise their effects.

Legislation specifically to abate noise nuisance has been progressively introduced in Australia since 1970, commencing with * Victoria and followed by Western Australia (1972), Tasmania (1973), New South Wales (1975) and South Australia (1975). In some of these States regulations to implement the enabling Act have been introduced; for example, in Western Australia regulations to abate noise annoyance in places of residence were promulgated in June, 1974. These Regulations are administered by the Medical and Public Health Department and applied to complaints of noise annoyance by the Local Authorities' health surveyors. Since the introduction of these Regulations, the Perth City Council has received 259 complaints of noise annoyance from 185 independent sources (up to August, 1975). Of these complaints, 193 have been resolved and only two have involved the serving of a noise abatement order.

* Subsequent legislation was introduced in 1975 to amend noise section of the 1970 Environment Protection Act.

A frequent cause of complaint under the Western Australian Regulations is due to the noise emitted by domestic and small commercial air conditioning equipment. However, the extent of noise reduction that can currently be achieved is determined largely by some of the limitations associated with today's air conditioning technology.

In Tasmania, noise abatement regulations were also promulgated in 1974 and include noise emission limits for a range of equipment powered by internal combustion engines. The types of this equipment that are most numerous and cause many complaints in residential areas are lawn mowers and chain saws. The noise emission limit for lawn mowers established under the Regulations is similar to that set in several other countries and has been selected to induce manufacturers to produce quieter mowers. Noise reduction is gradually being achieved by carefully controlling the speed of operation and through the development of quieter engines and blade/cutting disc profiles. In order to determine whether the regulatory noise emission level has been achieved, a method of test has been evolved and introduced. With regard to chain saws, only very slight reductions in noise emission have been achieved to date.

Since the introduction of the Noise Abatement (Annoyance of Residents) Regulations in Western Australia, their appropriateness and practicability has been assessed and, as a result, they are currently under review. Modifications may include different methods for assessing the level of noise that is acceptable within a given environment and for adjusting the measured level of the ellegedly offending noise. In addition, local authorities are finding that they are having to expand their existing noise abatement facilities, particularly in terms of equipment and staff availability, in order to meet the increasing public demand for relief from noise annoyance.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 7A - CONSTRUCTION, DESTRUCTION AND MAINTENANCE

CONVENOR:

Roger Wilkinson,
Acoustical Consultant,
Carr & Wilkinson,
SYDNEY.

PANEL:

Keith Whatman,
Principal,
Keith Whatman Is Wrecking Pty.Ltd.,
SYDNEY.

John Bignell,
Project Manager,
Dillingham Constructions,
SYDNEY.

Alex Stuart,
Deputy Health Surveyor,
Woollahra Municipal Council,
SYDNEY.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SESSION 7A

CONSTRUCTION, DESTRUCTION AND MAINTENANCE

Very few building and construction sites comply with the allowable noise levels predicted by the use of the Standards Association of Australia's A.S.1055 - 1973, "Noise Assessment in Residential Areas", or its proposed amendments and/or its predecessors.

Whilst neighbours of building and construction sites apparently have an additional degree of tolerance to construction noise, as compared with industrial noise, designers and builders of future constructions must consider their activities' noise generation as still another factor requiring consideration in the project planning stage.

This Session will emphasise the necessity and prospects of planning for noise control, rather than delving into the historical matters relating to this subject.

Modern communities demand the maintenance or improvement of their environmental amenities and thoughtful developers and builders ensure adequate planning of their projects, to avoid costly injunctions and/or restricted hours of operation.

Most building projects commence with a site preparation programme, frequently involving demolition of existing buildings and excavation of basements and footings. Noise is one of the important environmental problems generated during this stage of the works and this Session will outline the state-of-the-art relating to the use of modern equipment and noise control techniques on this

subject. Emphasis will also be made on the potential for building design and construction techniques consistent with the eventual requirement to demolish the project at some time in the future.

Construction noise control is a subject dear to the hearts (and pockets) of many building contractors constructing inner-city and near-metropolitan projects. Contributors will discuss planning pointers and their related costs in order to avoid seriou delays and inconveniences in project construction.

Individuals' rights to a reasonable acoustical environment are frequently voiced through their local Councils. Councils can (and do) take action on behalf of their ratepayers, frequently resulting in injunctions and/or restricted hours of operation of building and construction activities. However, Councils may be amenable to extending hours of operation, providing the Contractor demonstrates ability to comply with acoustical and other environmental requirements of their neighbours and the local Council. Consideration should be given to positive incentives, rather than the negative incentive of fines or legal judgment.

Excavation and maintenance works have, thus far, been given little consideration from the noise control point of view. Current production air compressor and jack-hammer equipment is a considerable improvement on its predecessors but earthmoving and haulage equipment and maintenance excavation equipment require more positive noise control action.

Utilisation of modern blasting techniques can considerably reduce (or eliminate) conventional jack-pick excavation without danger of excessive ground vibrations or air-blast damage to adjacent properties. Such techniques, together with newly-developed rubber-tyred rippers, enable sensible, planned excavations without resorting to the currently exotic laser-beam or ultrasonic technologies.

Alternative building techniques, devised for a combination of

financial and environmental requirements have great potential for effective planning for noise control on building and construction sites. Such alternative techniques require a combination of design and construction considerations, culminating in a project free of costly down-time and/or modification costs associated with neighbours annoyed by construction noise levels.

Construction, destruction and maintenance noises are capable of effective planning-out of projects, within the bounds of tolerance of typical present and predicted future communities.

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

SUMMING UP BY CONVENORS

SESSION 2A - CONVENOR R.J. CARR - INDUSTRIAL NOISE - THE WORKING ENVIRONMENT

We explored, with a reasonably interesting multi-disciplinary panel, the known and other not so well known problems and/or benefits of excess noise in industry. The problem of hearing loss of course was covered in other sessions.

The areas we looked at were in three categories: people and/or processes particularly with respect to productivity, physiological problems and psychological problems. I suppose, as a result of discussions, all one can conclude is that there is some affect.

In beneficial areas we discussed the relation of the inherent or deliberate use of sound, and in this respect Muzak of course is one of the obvious ones, with respect to arousal, stimulation aspects, reduction of boredom and the use of sound for positive feedback of information from a process or a product.

To the person that makes the noise it is quite an important psychological feedback and satisfaction motivating factor. Of course it may be that he's got other problems.

The one aspect that emerges is perhaps not so much the unreliability of laboratory research but the limited data one can derive from this to apply or to extrapolate to the working place and to the working day. One can look at these laboratory tests which are done under controlled environments, pushing buttons, feeding them dry biscuits and so on, and one can say there is perhaps a bit of smoke. The problem is how do you go about investigating this in the workplace? One would have to suggest at the moment the problem can't be identified in an

actual dollar cost situation so industry is not going to be particularly interested in sponsoring its investigation. I don't think the community at large through research grants is likewise going to at this stage be encouraged to think their money can be spent in this direction either.

I think that like all aspects of acoustical design objectives there is no one acoustical environment that satisfies most people most of the time in most industries. In will all vary, depending on task, complexity, individual and group activity and so on, but it does behove us and everyone of course, to plan for relative quiet in the workplace. We can always add sound if it is desired for arousal but I don't believe at this stage, that the state of the art allows us to set down definite criteria for particular industries except relative quiet.

SESSION 2B - CONVENOR J. ROSE - AIR TRANSPORT NOISE

I think the point was made by the panel who led the discussion in my area that this was the most highly technical field, and being a highly technical field it was much more amenable to objective controls, that is, objective noise measurement systems and then regulations and then laws and administration of those laws. That is the way it has progressed.

Firstly the measurement systems were sufficiently accurate and repeatable that we were able to frame good regulations. The regulations were written in a realistic way in that only one large company went broke trying to meet them. That was the Rolls Royce organisation. They claimed that noise regulations written by the International Civil Aviation organisation were responsible for the failure of the Rolls Royce organisation. The industry also knows the costs much more accurately that most people do because the vehicles themselves are studied very thoroughly on an economic basis before they are ever designed, or built or operated, and so they know their costs much more accurately than most other forms of noise generator.

The next thing was that having written their regulations they also wrote

in the ability to progressively revise them. The first revisions are already taking effect and the noise levels are being wound down at a reasonable rate. The point was made by Bill Bourke in particular, that the aircraft operating today are about 20dB quieter than they would have been if there hadn't been those regulations. Now I don't know of any other form of noise where there has been a progressive reduction of 20dB over a relatively short time.

The other matter that the panel introduced was that the people on the ground also have been brought in and can participate in answering a query that was raised earlier on - everybody knows how to complain about aircraft noise. In fact there is a setup around every civil and military airfield in Australia for recording every complaint that comes in. There is a telephone number in your local book telling you to whom you can complain 24 hours a day, so this is again an area that has progressed a long way beyond most other forms of noise. Now we are getting to the stage where the dB return in noise reduction per dollar expended in this way is falling very rapidly and it's costing millions to get another 2 or 3 dB off noise levels of aircraft. The position is quite clear that it's going to cost many less millions to start planning communities near airports and this is the one thing that seems to be lacking completely. We are still in the situation where we feel that the aspect which this conference hoped to encourage seems to be the area that is lacking most.

SESSION 3A - CONVENOR H. WESTON - INDUSTRIAL NOISE - NOISE AND HEARING

One thing that was perhaps a disadvantage in our session was that whilst everybody had an in-depth direct interest in industrial noise, there were very few people there from noisy industries. Some of the baits that were thrown were not taken up. A point was made that the growing cost of workers' compensation does not seem a sufficient incentive to motivate industry to do much about it in comparison with what some of the costs might be to reduce the noise. The point was brought out that already estimates of up to perhaps $10,000,000 would be required in some industries

to reduce noise so there is quite a problem. It was also brought out that the main objective of an industry was to make a profit and that this cannot be overlooked in talking about reducing noise. But there is a lot of evidence that, whilst there are difficulties, industry in general does have its social responsibilities in mind. They know there is going to be legislation and they are prepared to do quite a lot of work to comply with it. Research is being done on such things as, for instance, quietening a forge hammer or instead of hammering things to adopt a squeeze-press process which is much quieter. So this is perhaps a trend for the future. One comment was made on the method we often see in the literature of reducing noise exposure by administrative control of noise, that is, you move the employees from point A to point B to get them out of the noise. In most practical work situations this is a theoretical solution rather than a practical one. My own view on this is that administrative control is a lot of codswallop, and there was some evidence to show that this is true. However, in some cases, the risk can be reduced by putting employees in acoustic enclosures for part of the time.

There is in industry a general fear of legislation, it's going to be complex, it's going to create problems in industry, it is also going to create problems for people trying to administer the legislation. There are 34,000 factories in N.S.W. and at a guess I'd day 95% of them have a noise problem, so in spite of the fact that we say its very easy to control noise by legislation, it's going to be fairly difficult. Following the recommendations of the National Health and Medical Research Council the figure of 90dB(A) for 8 hours was mentioned as a criteria for legislation but with a recommended provision for a further reduction after a time. I think industry and consultants will be very wise to keep in mind that the N.H. & M.R.C. suggests that in 5 years it should be reduced to 85dB(A) for 8 hours and that new equipment should comply with this criteria now.

One particular point was made which I think is worth repeating: in buying equipment you get what you pay for. There are some pretty cheap meters on the market and the advice given was that you should try to avoid these cheap meters as they can be very unreliable. I know one particular case where the meter boosted the signal at 1000Hz, it was accurate at 2,000Hz and from there upwards it dropped off at 30dB per octave. You can judge better using your ears than you can with inaccurate equipment.

Noise dose meters were mentioned and it does seem these do have a future for varying steady state noise but there were reservations expressed regarding their use for impulsive noise. This is a pretty difficult field anyway and I think there has got to be more research done on it.

Specifications for noise have been used in the past when calling tenders for equipment; they have got to be used more in the future. In some cases there have been no replies or the tender has been so overloaded with contingencies in an effort for the manufacturer to reach the specification that has been unrealistic and entirely out of the reach of the industry concerned. There are however, indications that specifications have been an incentive to manufacturers to reduce their noise levels. What has happened in a lot of cases is that manufacturers of equipment have put in tenders where they can perhaps not meet the specifications but nearly meet it, and this is a good thing for the future.

On the union viewpoint, one very good point was brought out that applies both to the unions and to the management, and it is that we tend to look upon noise as a technical problem and overlook the communications aspect. The best way to get good communication between people is to have communication between people at similar levels. This has been found in management, for instance, if you want to get something over to the guy on the floor you don't send the General Manager down, you get the man talking to his immediate supervisor. The unions have found this too, they are very keen on educating their members but they don't do it from the top. They realise that the shop steward is the one that the workers in the shop believe, he is the one they take notice of.

Audiometry is also a necessary part of hearing conservation. Unions at some stages have tended to resist this. The reason has been that they see people refused employment because they have defective hearing. There are cases where people have been retrenched from industry and later in better times when people have been taken on again, some have not been re-employed because they have had a hearing loss originally caused by the same employer. Now this does tend to make the unions very suspicious of employers in general, but the unions accept that audiometry is a necessary part of the problem, they are willing to go along with it providing the

employee is given a copy of the audiogram, which I think is reasonable.

The unions also are quite agreeable and realise that hearing protection must be used and they are willing to try and educate their members on this. However,they don't like the authoritarian approach of some employers. In other words there has to be consultation between employer and employee to get the correct information over. The unions intend to educate their members on the effects of noise and on protecting themselves.

The question was raised in the discussion on the use of hearing protection as to whether people such as heavy transport drivers, may miss out on some particular signal. It was generally accepted that if you can hear a signal or conversation in a noisy situation without hearing protection, you will hear it just as well, and probably better, with hearing protection. There could be some exceptions where due to an initial hearing loss the employee may not hear certain signals when he is wearing hearing protection, so this does indicate that management must investigate objections before they make personal hearing protection compulsory. Representatives of both employers and unions considered that in regulations it would be feasible to require the employer to notify the appropriate authority when the wearing of hearing protection presents difficulties.

An example was given of a heavy industry which has made considerable progress in hearing conservation. The company introduced a programme which included examination of equipment and processes for practical methods of noise reduction, hearing protection, audiometry and employee education sessions. Employees were informed of the effects of noise and of their responsibilities in the programme, and each employee whose hearing was tested, was given the results. The engineering section was able to reduce some noise at source, to acoustically silence some equipment, to insulate some noisy areas and to provide part time relief for some operators by enclosing control panels.

Contrary to the fears of their insurers, the notification of employees of their audiometric results did not trigger off a spate of deafness compensation claims. On the company benefit side, there was an improvement in employee morale and performance and the modification of processes to reduce noise resulted in a cost reduction.

Whilst there are still many noise problems to be solved the example of this company might well be followed by other employers in the future.

As far as future legislation goes, it must provide for examptions when employers can't get the noise levels down to reasonable figures. This introduces quite a problem. Somebody has to decide when this request for exemption by management is relevant and when it is not, and this would involve lots of well trained scientific and engineering people in policing and advising on the regulations. The same applies for assessment of the risk for legislation purposes; this is going to produce a lot of problems.

So finally the general consensus of opinion from comments both during the session and afterwards, was that the control of occupational noise is complex, enforcement by legislation could be cumbersome, the responsibility for the control should be shared by both the employer and the employee, and the concept of self-regulation with simplified employer/employee consultation and voluntary codes of practice might well provide a flexible and practical means of control in future.

SESSION 3B - CONVENOR A. LAWRENCE - LAND TRANSPORT NOISE

If we use AS 1055 and their tabulated acceptable sound levels as a guide, noise of road traffic in many cases is currently in the widespread annoyance category. Now the session immediately raised doubts about this because first of all is it valid to use AS1055 for moving transient sound sources and secondly are prople really annoyed or disturbed by noise from roads? As far as the first query is concerned, if high flow rates exist although individual vehicles are transient, I think it's fair to say that the traffic stream is a fairly constant noise source and it's probably reasonable to expect that people would respond to traffic noise in the same way as to a fixed broadband source. Reasons for lack of complaints, and this came up again this morning, may be partly because people don't know who deals with the problem or they think it's in the too difficult bracket. From the results that were presented at the session it appears that current levels near motor traffic streams are at least 15dB(A) too high, that is, related to the AS 1055 levels.

Reductions of noise can be obtained by very significant reductions of flow rate, about 3dB(A) for 50% reduction in flow rate; by reduction of the percentage of heavy vehicles and also by large increases in the distance between the road and noise sensitive road users. These don't really seem to be economically practical. The alternative of course is the reduction of noise made by individual vehicles.

ADR 28 came into force for diesel trucks and motor bikes from the 1st July and these are the noisiest of the vehicles on the road as far as new vehicles are concerned; it has, of course, been in force since January last year for some of the other vehicles. However we can't expect much reduction because of the introduction of ADR 28 because allowable levels are far too high. Australian vehicle manufacturers and distributors have not exactly been in the vanguard of those planning for reductions of noise levels. They have in fact resisted as long as possible doing anything about noise particularly as heard outside the vehicle.

We had one of our panellists who showed us how an enlightened fleet operator concerned primarily with hearing conservation of the truck driver and seemingly with adverse community reactions has been able to persuade the manufacturers to produce very large trucks with over 300hp engines with levels some 6dB(A) below the current ADR 28 requirements and also with a reduction of some 12dB(A) of the noise heard at the driver's ear, that is, a reduction from about 98 down to 86dB(A) which is getting down to what Horrie Weston would be recommending. Because the first vehicles that were treated were done on a cut and try basis the cost was over $3,000 and there was a weight penalty of more than 250Kg. This of course costs money in the operation of a vehicle. Later vehicles however have now been introduced with the same result for a $500 to $1,000 penalty, the difference being whether or not to use a fan clutch assembly, and the weight penalties are now only 50Kg. This one company has a fleet of about 80 large trucks and they now have a programme of engine replacement and retrofit. Over 3 years they are spending $90,000 for this programme of noise reduction. The conclusion, is, of course, that noise attenuation is expensive. On the other hand, if you leave it to the individual person who is annoyed by noise to pay out the money, we found recently that it may cost more than $2,000 per room, this includes air-conditioning, to get tolerable conditions for a high flow rate. If you multiply $2,000 by the number of rooms that

are affected adversely by traffic noise you end up with millions of dollars.

On the public transport side we looked to the future and we learned of the Australian Government's proposal for the Australian standard bus and Australian urban passenger train. These projects are wending their way through the tangle of State and Federal politics but they are now at a stage of performance specifications and prototypes. Although it's not expected that everyone is going to be enticed from their cars it is realised that people using public transport are going to demand far higher standards in public transport, standards comparable to their own personal transport vehicle. Noise is only one of the aspects, and this has got to be kept in mind, it's just one of the many design criteria. The aim for buses is 78dB(A) for external noise, which compares with the 89dB(A) which ADR 28 allows and 75dB(A) for internal noise. The aim for the train at 110km.p.h. is 85dB(A) peak external and 70dB(A) internal. If you have ever ridden on a Sydney train I think you will agree this is a vast improvement.

As far as the planners are concerned their main problems seem to be firstly that there were no generally agreed acceptable noise levels and they would like to see noise levels legislated for. They point out that a lot of their work is done for Government departments who say "well who has that report come from,". They would much rather have something that was clearly laid down and legal. And secondly they are concerned that they don't have generally agreed methods of predicting transportation noise.

It's quite obvious from the session that we need to communicate far more with each other. The public needs to be able to communicate. They want to know who to complain to if they are annoyed. Perhaps they ought to be prodded a little to complain more. The acousticians must talk to the planner, the planner must talk to the acousticians, the vehicle operators must talk to the manufacturer. It is quite obvious that the technology is available for significant noise reduction of the individual vehicles, it is also evident that noise control is very costly and I think the conclusion is that we've got to face these costs and we've got to find

out how we can share them equitably.

SESSION 4A - CONVENOR J. HULME - INDUSTRIAL NOISE - THE EXTERNAL ENVIRONMENT

Firstly we tried to identify the types of industries and equipment that are noisy and cause complaints. It can be assumed that no industrial complex would want to cause a complaint situation, it therefore seems that noise impact on a surrounding community has not been considered during plant design or expansion. Often the concept of noise control is accepted but not fully understood and an attidude of hoping for the best is taken.

Large industrial complexes tend to generate more noise complaints than most of the smaller ones but this is usually due to the greater number of residences bordering the larger plant rather than to noise levels produced by the plant. In some industries, noise control is difficult because of the large number of sources which need to be treated before any overall decrease in noise level is achieved. The view was put forward that in considering the external environment, control of industrial noise could be achieved far more effectively and easily by controlling the overall noise emission at the boundaries of the industry rather than by controlling the noise by equipment specification. Obviously changes in the number of items of equipment used, and in processes will result in changes in external noise level and this is that the resident is interested in.

Zoning was next considered. The point was made that a noise zone line does not suddenly attenuate a noise passing across it. The noise level acceptable in the higher zone cannot reduce to the noise level acceptable in the lower zone at the boundary. Zones should be graduated and any noise zoning should be carried out with concern for the overall noise levels of an area both present and future.

There are many problems associated with zoning, particularly due to the wide range of areas to which it must be applied, these include existing old areas, developing areas and completely new development areas.

The draft policy for Richmond in Victoria and AS 1055 which are both under review have, although their limited application has been made clear, been used widely by local Councils and other bodies. In Victoria legislation is yet to be brought down although this should occur very shortly and uncertainty reigns in the minds of Councils and industrialists. A system of rating existing areas must be set up so that Councils are capable of making fair and proper land use decisions. Guidelines on acceptable noise levels for particular areas or situations are necessary for industry and the community and zoning must be a No. 1 priority.

Another method of looking at the external noise environment is the use of equal noise contour lines. An actual case study was used to demonstrate the effect of several noise sources on a residential area, namely traffic noise, railway noise and noise from two process plants. Noise contours were presented for each situation and this enabled the industrialist to see what his responsibilities were for future planning.

The final panellist discussed the noise aspects involved in planning new plant. The most important parameter for noise control is the tolerable or acceptable level for the particular community. Management is faced with expending possibly large sume of money with apparently no financial return and, so that money is not wasted, firmly established yardsticks must be available to work to. When noise is included as one of the important parameters during the investigation of the new project, benefits such as minimal cost solutions and the provision for future treatment can be gained. When a noise has caused annoyance it is difficult to cure the problem because the character of that noise would still be present at lower noise levels. It is therefore better to assure that a complaint does not arise at all.

That concludes the summary of the main points brought forward by the panellists but quite a deal of discussion was then generated. It was generally thought that a realistic system of zoning should be developed with consistent guidelines laid down. However it was stated that in one particular case measurements taken at one point of steady state noise for an industry vary over a range of 18dB(A) and that zoning is therefore

impracticable. This situation may not occur very often but it was suggested that criteria such as sound power level could be implemented. Both AS 1055 and the Victorian draft policy for Richmond came under fire with regard to zoning. It was noted that the policy includes no reference to ambient, and it should do so, but a further point was made that the use of ambient as an acceptable level is far too stringent for considering new and developing areas.

The question arose as to how many complaints should constitute a valid complaint. Should an industry have to spend large sums just to satisfy one person? Perhaps in this situation government aid should be given or the resident's house sound-proofed. This is related to other cost benefit aspexts. Should the polluter or the community pay, and is there much difference anyway in the long term?

It was suggested that industries could buy out small residential areas. There are problems associated with this. It may be unfair to expect the industry to provide its own buffer zone and in some cases land use planning by the local council may preclude this. Also it is surprising to see how property values rise and noise complaints increase when industry takes such a step.

A solution to noise from trucks delivering raw materials to or taking products from industrial premises was put forward. The suggestion was that industry be built half way down a hill, so that trucks could roll in and roll out. Perhaps in a more serious vein it was put forward that when new plant is being planned, the submission of a report on the noise likely to be generated should be mandatory.

Finally it was felt that many noise problems could be solved if residents and industrialists would be prepared to meet and discuss those problems. Similarly, regulatory bodies, acoustic consultants and town planners together with industrialists and residents should establish regular communications so that the many facets of this situation can be discussed and integrated planning can be carried out.

SESSION 4B - CONVENOR I. LAWRENCE - WATER TRANSPORT NOISE

We looked at several specific areas, at how to overcome engine and equipment noise, at some of the local noise control regulations and we looked at public transportation noise from waterborne craft. We looked at draft standards for measurement of noise in ships and from ships and we looked at shipboard noise operational criteria. In general, the problem can be split up into two sections, that of the community response and that of the operational area of the vessel.

In the community area we have had evidence of problems having come from operation of vessels, auxiliary equipment, power generation equipment and ventilation equipment on board ships while at berth. Cargo handling equipment is of course always a big problem. In the recreational area we've got a problem with high-powered racing boats but all these community aspects can be controlled with existing and future legislation. There is nothing particularly special about it, they are just normal engineering acoustical problems.

Getting on to the operational area however, we are looking at a very unusual situation in that we have a dynamic condition, a vessel in two fluids, and it's a little uncertain as to how we could go about measuring noise from and inside vessels. There are draft standard currently in Australia being re-examined but quite frankly progress has been very slow. An amount of work has been done overseas but generally speaking it has been restricted to fairly small vessels where measurements can be taken from waterside jetties and so forth. Obviously with a very large vessel this is impracticable. It might be doing 30 knots and with a very large vessel you can't expect to measure that inside a port or harbour. So that means you have to take your measurements from another vessel and you have interactions with wind, waves and all sorts of things, it's a very big problem area.

We are now seeing some tremendous improvements in the new generation design of vessels. Gas turbines are being used instead of conventional diesel engines, and there are very significant reductions in shipboard noise transmission and the conditions on board vessels with gas turbines are

very much improved. Gas turbines have certain operational problems in that they can only use certain fuels which cost a lot more than fuel for diesel engines. This is being overcome and a fair amount of research has been done on improvements in firing heavy fuel oil in gas turbines. I think that technology will probably overcome these problems fairly shortly.

We had a very good presentation from Lee Kenna on ship noise criteria that are in force throughout the world. Again there is a fair variation here, I think from memory there is about 15dB(A) variation from the best conditions to the worst conditions. In Australia it's going to be a problem to determine which is the optimum condition to use. It looks as though we can plan for quite satisfactory limits in terms of the traditional operational noise exposure limits at the conceptual stage of design of the vessels.

One final point that is worth noting is that commercial or merchant vessels are generally speaking a one-off item. They are not a mass-produced item but involve a tremendous amount of capital to operate and build, and it's therefore very difficult to be able to come up with a set of standards for all aspects for all aspects but we are certainly progressing and given time we are going to overcome the problem.

SESSION 5A - CONVENOR VIC MASON - BUSINESS NOISE - OFFICES & SHOPS

The conclusions from our session can perhaps be summed up briefly by a short conversation I had with a psychologist who was on the session. He said "Most of the discussion and a lot of the talk at the session was in fact of a psychological nature." He apologised for the fact that he didn't contribute much to the discussion but he said "I'm afraid psychologists know little more about the problem than acousticians seem to, in certain areas."

Having said that most of the session concerned psychological problems, in fact, the first speaker talked of other areas. He was concerned with

the background noise in offices and shops and the specification of that background noise. While agreeing that noise rating levels ought to be used, he thought that they ought to be under slightly tighter control. In particular there ought to be a control of noise in the octave bands used for speech interference levels. He said the advantages of this would be that the acoustic designer of office spaces could be more certain as to the requirements for screening and partitioning. He could then specify screening with transmission losses that he knew would just do the job rather than at the present where he had to over-design in case the background noise in the speech interference bands was low even though the correct NR level was reached by whatever noise conditions that were present.

He thought that this meant that noise conditioning from air-conditioning would have to be done away with and we would have to silence the air-conditioner as much as possible and apply electronic noise conditioning on the basis that this seems much more flexible. You could get exactly the background noise you require and having got exactly that background noise at slightly greater expense than from a normal air-conditioning system you would then save potentially on the sort of internal partitions that went up in the office space. There was unfortunately relatively little or no discussion on this in the discussion period at the end of the session.

The second speaker was in fact the psychologist. He discussed background noise music and its application in offices and other areas, hospitals and dentists' rooms and places like that. He concluded that it's very difficult to be sure that the addition of such background noise is going to be successful, it depends very much on the tasks that are taking place in that environment.

If the task gives very little stimulus to the person doing it, then possibly some background noise would add extra stimulation and therefore be beneficial. If the task was already one that required all the attention of the operator and was therefore giving him plenty of stimulation, then extra music would over-stimulate the person and possibly productivity might fail. He then went on to say that these were only generalisations. To do a controlled experiment on the effects of background noise music was

very difficult and hence the generalisations should be used with caution. He did say that people who worked in offices with background noise music invariably preferred it to the situation without music, particularly when it was, in effect, suddenly switched on one week and they were questioned a few weeks or months later. But there was no very general or definite evidence that it was beneficial from a productivity point of view, under all circumstances.

The third speaker considered open plan offices. He considered that to a certain extent they were over-sold in the early stages when open plan offices first came into being and that some of the early offices had not been planned as well as they might have been both from a work environment and acoustic point of view, and for control of the work within the office. As a result they haven't been as successful as they might have been.

He thought that open plan offices have a definite place in office planning and that whenever they were contemplated a very careful analysis should be done in planning the office. He pointed out that there was an Australian standard on its way that gave further guidance on the background noise that should be provided in such offices and he questioned the real need for privacy in offices, or at least the degree to which you needed privacy.

He thought that more work was required on such things as acoustic ceilings to get them to as high an acoustic standard as possible. He thought office machines such as typewriters and office copiers required extra attention and that more work was needed to get acceptable electronic background noise conditioning.

There was some discussion as to whether air-conditioning background noise was natural background noise and electronic background noise was artificial background noise. The distinction wasn't taken up but there was a feeling that some people thought electronic noise was artificial. The discussion then went on and was mainly concerned with open planned offices. We heard about the manager's desire often for a little womb at the corner of the room, as it was put, to which he could retire, cosy and comfortable, and every so often come out and stir up the workers and then retire again. We heard about the problem in the public service where in some areas

people were allowed about 1/3 of a potplant and 1/4 of a screen in open plan offices and this restricted them somewhat, there were also some questions as to whether open planning was the right way to go in some areas in the public service. Those minor points aside, the problems of open plan offices in general were discussed, aspects such as the fact that if you put a screen round someone or some small area, people in that area might tend to talk louder because they see a solid wall round even though in fact the transmission loss of that wall is very low, and so putting a screen there in fact increases the talking noise level and removing the screen may be beneficial overall. They talked round this sort of thing and came to the conclusion that there were problems with open plan offices but probably if they were well designed they were a good innovation and should be used.

SESSION 5B - CONVENOR R. SATORY - RESIDENTIAL NOISE - THE INDOOR ENVIRONMENT

It was agreed by the panel and the convenor that the reason that we were assigned the subject is that nobody in Australia had done any work on it. We agreed that there was very little work done on this subject in thw world except on some small aspects. We do know how much noise a washing machine makes but very few people, it turns out, have really been working on reducing the noise. We heard of a manufacturer who actually had been able to reduce the noise by some 15dB and his sales went down. Maybe you don't want to pay that little bit extra for noise reduction because you're just interested in that model. The noise levels from domestic machines are quite high. A dose meter was tried but there was no sign of any significant noise level limits and it was discussed that the dose meter would be recalibrated and tried again in order to get at least some data.

The noises that you get from these machines do affect communication within the house and the irritation caused by them is significant in that the home environment is maybe not enhanced by all of these things when you look at the overall life. Having something to do the chores for you could be alright but it may not be the answer to a really bigger life. The thing that can be done in the design of the house is to improve

communication in the sense of where you put the sound absorption and how you reduce the sound transmission of walls.

We had in some senses the best panel, we had the smallest panel and we had the largest panel, because we had participation. People really got involved and they told us things. It turned out that those of us who had been indoctrinated in the field and had read the data found out from these people that traffic noise was the problem but it was found out from those who really know that it was the vacuum cleaner that was the problem. This is one thing that really interferes with the type of communication you need within the home, such as to be able to hear the telephone. Vacuum cleaners are real problems and we decided that there is probably only one way to get the results on this type of thing. The lady when she goes out and buys one is the real control but she feels as though she cannot influence the manufacturer of a vacuum cleaner to make it quiet. She can shop round and pick out the quietest one but this is very difficult. It was suggested that as a Society we have the responsibility to encourage studies of the noise levels of these various items. By giving this information in such a way that we actually hit back at the pocketbook of the manufacturer by the number of sales he has, this is probably the way we as a Society can influence noise levels in the home to the greatest amount.

SESSION 6A - CONVENOR P. DUBOUT - SPORTS NOISE - RECREATION AND ENTERTAINMENT

Noise is becoming pretty big business - the large attendance at this Conference bears this out. Most of us are here because of some professional connection with noise. Either our incomes derive in part from the existence of noise, or conversely we make noise while producing income or travelling to seek it. Session 6A dealt however, with the noise everybody makes in an amateur capacity during recreational activities, in many of which sound emission may be the very essence, not just a by-product. Here we are dealing with the noise that we make when we are having fun.

During discussion towards the close of the session, an important issue emerged explicitly - should noise problems in the community arising from

sport, recreation and entertainment be dealt with under the same kind of rules and regulations as might be applied to say industrial noise? Very often it occurs for limited times, say Saturday nights only or quarterly race meetings on a noisy race track or something like this. What is the loading which should be allowed here, what licence should be given because of the fact that a certain group of residents are exposed at periodical intervals to a noise which is more or less an inevitable outcome of some very much desired community relaxation or enjoyment procedure? The following selection of points made by panellists or delegates during the session relate, more or less, to this question.

Our panellist discussed examples of costs of reducing the spread of noise from recreational sites. The cost per decibel of reduction is not very different from that involved for any other fixed-location community noise sources. The cost per person involved in payment may be fairly high however - e.g. another panellist related that in the case of a PA system at an existing sports arena, the cost of re-design to comply with guidelines such as AS1055 was estimated so high that the sporting club was obliged to do without the system. A delegate concerned with drafting of state regulations reported that the assessment rules in AS 1055, as regards level, frequency of occurrence, etc. of noise were more difficult to apply to say dance halls than to factories, and perhaps less appropriate also.

Municipal officers present did not seem to think that recreational noise needed very special consideration; and even if it does warrant special types of regulation or more or less tolerant licensing, then these are just as important to codify explicitly as are rules concerning industrial noise. A psychologist pointed out the weaknesses in general of our efforts to correlate noise annoyance with physical measures of noise characteristics, and of the assumption that the level of complaints is a measure of the disturbance actually caused by noise - but there was no suggestion that these weaknesses applied more particularly to recreational noise.

A spokesman for the Confederation of Australian Motor Sport described how the organization introduced compulsory fitting of a standard approved

muffler to all cars at a premier Australian motor race circuit with results satisfactory to state and local government officials and presumably to local residents, if judged by complaint level.

Though the actual criteria of acceptability applied by the officials in this case were not revealed, the spokesman gave this as an example that reputable sporting bodies were prepared to adopt volumtary compromises. Similar noise regulations imposed on American race circuits seemed to have led to increased race attendances. The CAMS would be prepared to adopt similar procedures at other Australian circuits under its jurisdiction. An officer from another municipality containing a speedway was pessimistic - many people there tended to complain if the noise was even audible, although seemingly complying with recommended standards.

As regards risk of hearing damage voluntarily incurred by participants in noisy recreations, while there was general agreement that many recreationsl activities involved damagingly high levels, it was suggested that the participants did not usually expose themselves for sufficient hours per week to suffer serious damage from these causes alone. The problems of state intervention in voluntary activities and regulations to minimize damage risk were not discussed. However, the important point was made that exposure during leisure hours, added to occupational exposure, could be very significant in determining hearing loss experienced by individuals. Since the principle of state intervention in hearing conservation in industry was accepted as a proper preventative public health function, it was logical to seek ways of extending the principle from the hours of earning to the hours of leisure, if it was to be really effective in the former.

To sum up, the majority of contributors favoured the attempt to control and plan for recreational noise with the same diligence we might apply to noise from traffic and industry.

SESSION 6B - CONVENOR DR. C. MATHER - OUTDOOR RESIDENTIAL ENVIRONMENT

I think the unanimous conclusion that was reached by our session was that it could have continued a lot longer. We in fact did get a couple of requests to reconvene but of course in a situation like this it is just not possible. By circumstances our discussion was biassed towards Western Australian conditions and the apparent success of application or otherwise of our regulations to control noise in the residential environment. We discussed some of the sources that contribute to noise complaints, although judging by the complaint rate from one of our major shires, Perth City council, not necessarily the major noise sources.

We talked about unit air conditioners where we learned that noise emitted to the outside can be a problem. Of course the inside has to be relatively quiet because the purchaser is involved here. The noise can be reduced at a considerable monetary cost if no serious penalty is to be incurred in the performance. Our panellist brought up the fact that split units were becoming increasingly popular, whereby the quiet or comparatively quiet air handling component is the part put inside the purchaser's house and the far noisier compressor/condenser component is quite often put adjacent to a neighbour's bedroom window. When he opens his window for relief on a hot night he hears the great noise and with a scream has to slam his window shut again. It was suggested that noise nuisance arising in these type of air conditioners were as much the responsibility of the purchaser as of the manufacturer, that is, that the purchaser should be educated and understand just what sort of product he is buying in all aspects, including noise.

Next we looked at lawnmowers where the main source of noise seems to be from the blade. Noise level is also, of course, a function of lawnmower speed. Our panellist from the Environmental Protection ½uthority in Tasmania wxplained how he had developed a special test technique to evaluate the amount of noise emitted by lawnmowers and he went on to explain how he is currently using this method. A brief mention was also made of chain saws. I think the feneral feeling was that if you used them intelligently (whatever that may mean) they were no problem.

Next, we turned to possible ways we may improve our measurement techniques and criteria for assessing noise annoyance in places of residence. We discussed whether or not it was desirable, as it appears in our case now, to use the background sound level as the criteria of assessment. We discussed types of measurement and how to go about it. It was not discussed but a point I would like to mention, and I think I can bring it up as our regulations are currently being revised, is that we are in serious trouble if anyone brings an action under the regulations because we have specified that the sound level meters used to do the measurements have to have been laboratory calibrated in the previous 12 months. Needless to say there are no facilities in Western Australia whihh can fully calibrate the sound level meters in accordance with the Australian Standard.

I had hoped to have a town planner to talk about various aspects of preferred planning for acoustic environment but unfortunately it wasn't possible for him to come. Although as I have already made clear our session didn't have time to formulate any conclusions as such, I feel that the whole session highlighted that in spite of how much we hear and others in the profession and in industry may be committed to noise reduction and to creating an acceptable acoustic environment, in the end the policies regarding acoustic environments will continue to be significantly influenced by political factors. This may not always be in the best interests of our community.

SESSION 7A - CONVENOR R. WILKINSON - CONSTRUCTION AND DESTRUCTION NOISE

Early in our session we made a statement which was not challenged during question time and that was that most construction or destruction or excavation sites in Australia would currently now comply with regulations in force in the AS 1055 document. We then went on to make the observation that most of our city buildings are currently being designed with maximum life span for economic and functional capacity of 75 years. Now a little bit of simple arithmetic means that in the year 2050 all of the buildings we currently see in cities such as Sydney will be replaced. So in that time a lot of demolition and construction and excavation work is going to be conducted.

In order to plan towards that objective we decided that it would be a good idea if we were to take two "naughty" cases. Cases that were so naughty that they served as good examples for the sort of planning in depth efforts and endeavours that are going to be required in the future. John Bignell led us through the QANTAM project and Alex Stuart led us very ably through an Eastern Suburbs Railway civil works construction.

The discussion then went on to areas that we could foresee in a futuristic fashion leading from already available silenced equipment through to alternative techniques of demolition and construction so that we could start to formulate ways of tackling this sort of thing. The overrriding observation was that in order to achieve satisfactory acoustical performance from a construction or demolition site, you've got to think it out, and that ranges from the time of your arrival at the site to the time you pack up and say thank you and everybody goes home.

The discussion period was a little short, but a couple of points brought out were indicative of the fact that we certainly haven't thought of all the futuristic noise control alternative tachniques involved or possible. Hopefully the session has commenced to water the seeds that were sown so that we as acousticians can be planning towards a much more effective and a socially acceptable construction and destruction process.

John Colliss was kind enough to bring a number of copies of the City of Sydney Council's draft code for the control and regulation of noise on building sites and anybody who hasn't had the opportunity of getting a copy from him should do so.

We decided that, whilst there was a lot of work to be done in construction and destriction noise control, there are alternatives to the current techniques available and certainly there is some light at the end of the tunnel.

AUSTRALIAN ACOUSTICAL SOCIETY 1975 CONFERENCE

'PLANNING FOR NOISE'

PROGRAMME

Friday, 19th September

9.30 am	Registration
10.40 am - 11.10 am	Opening Session 'Planning for Noise' by Tom Uren, MHR, Minister for Urban & Regional Development
11.10 am - 11.30 am	Morning Tea
11.30 am - 1.00 pm	Session 2A 'Industrial Noise - The Working Environment'

Convener: R.J. Carr, Acoustical Consultant, Carr and Wilkinson, Victoria

Panel: Dr. V.E.M. Shepherd, Medical Officer, Public Transport Commission of NSW

K. Keen, Psychologist, National Acoustic Laboratories

P. Williams, Engineer, Department of Labor & Immigration, Sydney

A. Mather, Technical Manager, Planned Music (Sydney) Pty. Ltd.

Session 2B 'Air Transport Noise'

Convener: J.A. Rose, Chief Engineer, National Acoustic Laboratories

Panel: W.L.J. Bourke, Divisional Engineer, Qantas Airways Limited

M. Franck, Airport Specialist, NSW Planning & Environment Commission

G. Douglas, Superintendent, NSW Region, Department of Transport, Air Transport Group

M.D. Dunn, Principal Engineer, Environment & Security Branch, Department of Transport, Air Operations Division

G.H. Foster, Councillor, Hurstville Municipal Council and National Sales Manager, TNT Transport System

1.00 pm - 2.00 pm	Lunch	
2.00 pm - 3.30 pm	Session 3A 'Industrial Noise - Noise and Hearing'	
	Convener:	H. Weston, Division of Occupational Health & Radiation Control, Health Commission of NSW, Lidcombe
	Panel:	M. Evans, Chief Engineer, ANI Australia Pty. Ltd., Lidcombe
		J. Sponberg, Amalgamated Metal Workers' Union, NSW State Office, Sydney
		L.A. Challis, Louis A. Challis & Associates, Acoustical Consultants, Sydney
		H. Burrows, Chief Engineer, John Lysaght (Australia) Limited, Port Kembla
		P. Kotulski, Division of Occupational Health and Radiation Control, Health Commission of NSW, Lidcombe
	Session 3B 'Land Transport Noise'	
	Convener:	Associate Professor Anita Lawrence, School of Architecture, The University of New South Wales
	Panel:	J. Latham, Department of Transport, Surface Transport Group, Canberra
		G. Pocknee, Engineer, B.P. Australia Ltd., Melbourne
		Marion Burgess, Senior Tutor, School of Architecture, The University of New South Wales
		N. Nielsen, Transportation Planner, De Leuw Cather of Australia
3.30 pm - 4.00 pm	Afternoon Tea	
4.00 pm - 5.30 pm	Session 4A 'Industrial Noise - The External Environment'	
	Convener:	Jill Hulme, Senior Noise Control Officer, Environment Protection Authority, Victoria
	Panel:	D. Growcott, Carr and Wilkinson, Melbourne
		J. Davis, Environmental Protection Authority, Victoria

J. Pettifer, Repco Pty. Ltd., Melbourne

P. Gardner, Vipac Laboratories Pty. Ltd.

G. Chenco, Australian Paper Manufacturers

Session 4B 'Water Transport Noise'

Convener: I. Lawrence, Sales Engineer, ACI Fibreglass, Sydney

Panel: L.A. Challis, Louis A. Challis & Associates, Acoustical Consultants, Sydney

J. Hawkless, Maritime Services Board, Sydney

L. Kenna, National Acoustic Laboratories, Sydney

R. Langford, Noise Control Officer, Department of Environment, Hobart

D. Wharington, Department of Transport, Melbourne

5.45 pm - 6.45 pm Australian Acoustical Society Annual General Meeting

7.00 pm - Dinner

Saturday, 20th September

7.30 am - 8.00 am Breakfast

8.45 am - 10.00 am Session 5A 'Business Noise - Offices and Shops'

Convener: Dr. V. Mason, Research Fellow, Mechanical Engineering Department, The University of Queensland

Co-convener: R. Heggie, Acoustical Consultant, James A. Madden & Associates Pty. Ltd.

Panel: N. Holt, Department of Psychology, The University of Sydney

P.R. Knowland, Acoustical Consultant, Peter R. Knowland & Associates

D. Perkins, Co-ordinator-General's Department, Brisbane

R. Rumble, Acoustical Consultant, Louis A. Challis & Associates, Brisbane

Session 5B 'Residential Noise - The Indoor Environment'

Convener: R. Satory, Acoustical Consultant, New Zealand

Panel: Professor D.C. Stevenson, Head, Department of Mechanical Engineering, University of Canterbury, Christchurch, New Zealand

10.00 am - 10.30 am Morning Tea

10.30 am - 11.15 am Session 6A 'Sports Noise - Recreation & Entertainment'

Convener: P. Dubout, Experimental Officer, CSIRO, Division of Building Research, Melbourne

Panel: M. Beard, Engineering Assistant, City of Keilor

Dr. R.G. Barden, Acoustical Consultant, Riley, Barden & Kirkhope

A.C. Clutterbuck, Director, Applied Acoustics Pty. Ltd.

R. Parkes, Victorian Secretary/Manager, Confederation of Australian Motor Sport

N.L. Carter, Psychologist, National Acoustic Laboratories

Session 6B 'Residential Noise - The Outdoor Environment'

Convener: Dr. Carolyn Mather, Investigating Officer, Architectural Division, Public Works Department, Perth

Panel: R. Caruth, Noise Officer, Medical & Public Health Department, Perth

B. Gray, Chief Engineer, Sandovers O'Connor, Perth

R. Langford, Noise Control Officer, Department of Environment, Hobart

B. Penkethman, Chief Health Surveyor, City of Perth

11.30 am - 12.45 pm	Session 7B 'Construction, Destruction & Maintenance'
	Convener: R.C. Wilkinson, Acoustical Consultant, Carr and Wilkinson, Sydney
	Panel: J. Bignell, Project Manager, Dillingham Constructions, Sydney
	A. Stuart, Deputy Health Surveyor, Woollahra Municipal Council
12.45 pm 1.45 pm	Lunch
2.00 pm - 5.30 pm	Sport and Excursion
6.30 pm - 7.00 pm	Cocktails
7.00 pm -	Dinner
8.00 pm -	Dance

Sunday, 21st September

7.30 am - 8.00 am	Breakfast
9.00 am - 10.30 am	Session 9 'Town Planning, Legislation & Standards'
	Chairman: R.A. Piesse, Director, National Acoustic Laboratories
	Open discussion by a panel drawn from the Conference
10.30 am - 11.00 am	Morning Tea
11.00 am - 12.30 pm	Session 10 'Summing-up'
	Chairman: P.R. Knowland, Acoustic Consultant, Peter R. Knowland & Associates
	In this Session, Conveners will discuss conclusions reached during the Conference.
12.30 pm - 1.00 pm	Closing Luncheon
2.00 pm - 2.30 pm	Closing Remarks by Conference Convener

AUSTRALIAN ACOUSTICAL SOCIETY

1975 CONFERENCE

PLANNING FOR NOISE

CONFERENCE COMMITTEE:

PETER KNOWLAND: JOHN MAZLIN: BARRY MURRAY: DENIS PICKWELL: PHIL WILLIAMS

BARBARA THOMPSON (SECRETARY)

NAME	TITLE	COMPANY	ADDRESS
AUBREY Owen L	Project Officer	C.S.R. Limited	11/19 Murray St LANE COVE NSW 2066
BALL Diane E	Arch. Student	H.J.Parkinson & Assoc.	22 Joffre St ASHGROVE QLD 4060
BARDEN Ronald G	Consultant	Riley Barden & Kirkhope	1 Princess St KEW VIC 3101
BARNES G A	Director	Applied Acoustics P/L	83 Lexton Rd BOX HILL VIC 3128
BEARD Malcolm	Sen Eng Asst.	Municipal Offices City of Keilor	Municipal Offices, Caldor Highway CITY OF KEILOR
BICKNELL Harold	Noise Exposure Forecaster	Dept. of Defence Air Works	13 Bage Pl MAWSON ACT 2607
BOWKER D	State Manager	Bruel & Kjaer	33 Major's Bay Rd CONCORD 2137
BRAY Valerie E	Research Asst.	Uni of NSW	12 Fairbairn Ave E. KILLARA NSW 2071
BREWSTER Flt Lieut			10 Denny St LATHAM ACT 2615
BURGESS Marion	Snr. Tutor	Uni of NSW	School of Architecture, Uni of NSW PO Box 1 KENSINGTON NSW 2033
BURROWS S H	Snr Project Eng	John Lysaght Pt. Kembla	9 Belwarra Ave FIGTREE NSW 2525
CARR Ronald J	Partner	Carr & Wilkinson	444 Burwood Rd HAWTHORN VIC 3122
CARTER Norman L	Head Psycho-acoustic Research	N.A.L.	25 Calga St E. ROSEVILLE NSW 2069
CARUTH Roy	Noise Officer	Occupational Health	Public Health Dept. Occupational Health Div. 57 Murray St PERTH 6000
CHALLIS Louis		Louis A Challis & Assoc.	158 Queen St WOOLAHRA NSW 2025
CHANNON S. John	Sales Engineer	Bestobel Acoustic Services	40 Maitland Ave KINGSFORD NSW 2032
CHENCO George	Environment Eng	A.P.M. Ltd	21 Prospect Rd ROSANNA VIC 3084
CLUTTERBUCK Alec	Director	Applied Acoustics	22 Moore St BOX HILL VIC 3128
COLLIS John W	Noise Control Off.	Sydney City Council	78 Sutherland Rd JANNALI NSW 2226
COOK K R	Lecturer	Royal Melb Inst Technology	53 The Outlook GLEN WAVERLEY VIC 3150
CREEK Andrew N	Arch Sales Mgr	Australian Gypsum	C/o 350 Latrobe St MELB VIC 3000
DAVERN William A		C.S.I.R.O.	C.S.I.R.O. Div of Building Research PO Box 96 HIGHETT VIC 3190
DAVIS John W	Snr Noise Insptr	Environment Protection	3 Olwen St NUNAWADING VIC 3131
DEWHURST I S	Sales Manager	Australian Gypsum	PO Box 106 PARRAMATTA NSW 2150
DUBOUT Paul		C.S.I.R.O.	Div of Bldg Research - as above
DUNN M D	Principal Eng	Dept of Transport	C/- PO Box 18390 MELB VIC 3001
DUNN S L	Project Eng	Ricegrowers Coop Mills	4/36 Wandoo St LEETON NSW 2705
EDEN David	Associate	Peter R Knowland & Assoc	2/245 Pacific Highway N.SYDNEY 2060
EVANS Malcolm W	Chief Plant Eng	A.N.I. Australia	PO Box 20 LIDCOMBE NSW 2141
FINSTEN Edward E	Director	DCE Vokes	C/- PO Box 105 ROCKDALE NSW 2216
FITZELL Robert J		Peter R Knowland & Assoc	21 Gooraway Pl BEROWRA HGTS NSW 2082
FRICKE F		Sydney Uni	Dept Arch Science Uni of Sydney
GARDNER P		Vipac	PO Box 53 SOUTH YARRA VIC 3141
GIBBINGS Dr D L H	Princ. Research Scientist	Nat Measurement Lab CSIRO	University Grounds CHIPPENDALE NSW 2008
GRAY Brian	Chief Engineer	Sandovers O'Connor	PO Box 213 CLOVERDALE WA 6105
GRIFFITHS D E	Sales Manager	Applied Acoustics P/L	83 Lexton Rd BOX HILL VIC 3128
GROWCOTT D K	Engineer	Carr & Wilkinson	444 Burwood Rd HAWTHORN VIC 3122

NAME	TITLE	COMPANY	ADDRESS
HANSSON T	Engineer	Soundguard P/L	36 Punch St ARTARMON NSW 2064
HARDING G E	Director	Nonoys P/L	PO Box 415 DANDENONG VIC 3175
HEGGIE R	Project Eng	J A Madden Assoc	2/17 Frazer St COLLAROY NSW 2097
HEINKE D	Chief Engineer	State Pollution Control Comm.	6th Fl Union Carbide House Liberpool St SYDNEY NSW 2000
HEWETT A R G	Eng Manager	Bestobell Industries	55 Falcon St CROWS NEST NSW 2065
HOLT N		Sydney Uni	Little Lovett Bay CHURCH POINT NSW 2105
HULME J	Sen Noise Control Officer	Env. Protection Auth. (Vic)	240 Victoria Pde E.MELBOURNE VIC 3002
IDE I D	Engineer	Public Bldgs Dept	52 Kenilworth Rd PARKSIDE SA 5063
JACK R T	Manufacturing Mgr	Coca-Cola Bottlers	The Crescent KINGSGROVE NSW 2208
JACOB L	Engineer	Pilkington ACI	PO Box 815 NORTH SYDNEY NSW 2060
JAMES R A	Engineer	Public Works Dept	2 Havelock St W.PERTH WA 6005
JEFFERIES M	Marketing Dir	Soundguard P/L	36 Punch St ARTARMON NSW 2064
JOHNSON J	Testing Eng	NSW Public Trnspt Comm	10 Leinster Ave KILLARNEY HTS NSW 2087
KENNA L		N.A.L.	5 Hickson Rd MILLERS POINT NSW 2000
KNOWLAND P R	Principal	Peter R Knowland & Assoc	245 Pacific Highway N.SYDNEY NSW 2060
KONDZIOLKA K		L A Challis & Assoc	158 Queen St WOOLLAHRA NSW 2025
LANGFORD R L	Noise Control Off	Dept of Environment	56 Carella St HOWRAH TAS 7018
LATHAM J S		Dept of Transport	PO Box 367 CANBERRA CITY ACT 2600
LAWRENCE A	Assoc Prof	Uni of NSW	25 Warrawee Ave WARRAWEE NSW 2074
LAWRENCE I	Sales Engineer	ACI Fibreglass	PO Box 264 ASHFIELD NSW 2131
LEE W A	Tech Services Mgr	Bradford Insulation	4 Woolgoolga St BALGOWLAH N NSW 2093
LINDEN D	Sen Health Insptr	Liverpool City Council	Moore St LIVERPOOL NSW 2170
LONGSTAFF B G	Scientific Off	State Pollution Control Comm	6th Fl Union Carbide House Liverpool St SYDNEY NSW 2000
LYON J B	Product Eng	Australian Gypsum Ltd	PO Box 106 PARRAMATTA NSW 2150
McBURNEY A	Managing Dir	A McBurney & Co	PO Box 151 BLACKTOWN NSW 2148
MARKS T		Vipac	PO Box 53 SOUTH YARRA VIC 3141
MASON Dr V	Research Fellow	Uni of QLD	Dept of Mech Eng Uni of QLD ST. LUCIA QLD 4067
MATHER DR C E	Investigating Arch	W.A. Public Works	2 Havelock St W.PERTH WA 6005
MATTHEWS W A	Works Manager	Tubemakers of Aust	PO Box 86 UNANDERRA NSW 2526
MAZLIN J G	General Manager	Acoustic & Environmental Cons	168 Walker St N.SYDNEY NSW 2060
MOFFATT J A	Sen Engineer	Carr & Wilkinson	PO Box 38 HAWTHORN VIC 3122
MULLER K	Dist Health & Bldg Inspector	Parramatta City Council	Civic Pl PARRAMATTA NSW 2150
MURRAY B J	Consultant	Carr & Wilkinson	56 Neridah St CHATSWOOD NSW 2067
NELMES M	Engineer	State Public Works Dept	
OTTAWAY F J H	Tech Manager	Coca-Cola Bottlers	The Crescent KINGSGROVE NSW 2208
OSTERHOIS I	Sales Engineer	Bruel & Kjaer	33 Major's Bay Rd CONCORD NSW 2137
PARTS A A	Acoustics Sect Leader	C.S.R.	43 Carlisle Cresc BEECROFT NSW 2119
PAUL S L	Manager	Nylex Corporation	Nepean Highway MENTONE VIC 3194
PATERSON T A	Sen Sales Eng	DCE Vokes P/L	PO Box 105 ROCKDALE NSW 2216
PATTERSON F W	Tech Officer	N.A.T.A.	688 Pacific Highway CHATSWOOD NSW 2067
PENKETHMAN B C	Chief Health Serveyor	Perth City Council	47 Wiluna St MT LAWLEY WA 6050
PERKINS D L	Sen Env Officer	Co-ordinator Gens Dept	PO Box 185 NORTH QUAY QLD 4000
PETTIFER J A	Env Prot Officer	Repco Ltd	608 St Kilda Rd MELBOURNE VIC 3004
PICKWELL D	Man Director	Soundguard P/L	36 Punch St ARTARMON NSW 2064
PICKFORD G	Engineer	C.S.R.	10 Jessica Gardens ST IVES NSW 2075
PIESSE R A	Director	Nat Acoustic Laboratories	39 Medusa St MOSMAN NSW 2088
POCKNEE G C	Asst Transport Eng	B.P. Aust Ltd	1-29 Albert Rd MELBOURNE VIC 3004

NAME	TITLE	COMPANY	ADDRESS
POTTER M H	Princ Bldg Insp & Health Surveyor	Kempsey Mun Council	PO Box 120 W.KEMPSEY NSW 2440
RILEY G	Principal	Riley Barden & Kirkhope	1 Princess St KEW VIC 3101
RISBEY G C	Tech Serv	Bradford Insulation	17 Cove St TURRAMURRA NSW 2074
ROGERS M		Vipac Lab	PO Box 53 SOUTH YARRA VIC 3141
ROSE J	Chief Engineer	N.A.L.	5 Hickson Rd MILLERS POINT NSW 2000
RUMBLE R		Louis A Challis & Assoc	158 Queen St WOOLLAHRA NSW 2025
SATORY R J	Principal	Satory Acoustic Service	1 Waiwere Rd LOWER HUTT N.Z.
SLIMMING R	Representative	ACI Fibreglass	PO Box 57 ST. PETERS NSW 2044
SMITH C	Acoustical Consult	James A Madden & Assoc	34 Northcott St WENTWORTHVILLE NSW 2145
SMITH M		Vipac Lab	PO Box 53 SOUTH YARRA VIC 3141
STEVENSON Prof D C	Prof & Head of Mech Engineering	University of Canterbury NZ	School of Engineering, University of Canterbury CHRISTCHURCH N.Z.
STOKES P M		Peter R Knowland & Assoc	245 Pacific Highway N.SYDNEY NSW 2060
STUART A	Dep Health Surveyor	Woollahra Mun Council	3 Denise Cresc PEAKHURST NSW 2210
VIVIAN TAYLOR J	Principal	Acoustic Advisory & Cons Serv	24 Onslow Ave ELIZABETH BAY NSW 2011
TAYLOR Dr K J	Sen Research Scientist Acoustics	CSIRO Nat Measurement Lab	University Grounds, City Road CHIPPENDALE NSW 2008
THOMPSON P	Health Surveyor & Pr Bldg Insp	Parramatta City Council	Civic Pl PARRAMATTA NSW 2150
THORNE R	Assoc Prof	Dept of Arch Uni of Sydney	1010 Barrenjoey Rd PALM BEACH NSW 2108
TOBIN E W	Safety Superintdt	John Lysaght (Aust) P/L	PO Box 77 PORT KEMBLA NSW 2505
WATT D	Engineer	Applied Acoustics P/L	83 Lexton Road BOX HILL VIC 3128
WESTON E T		Experimental Bldg Station	PO Box 30 CHATSWOOD NSW 2067
WESTON H R	Scientific Officer	Health Commission	Div of Occupational Health & Radiation Control PO Box 163 LIDCOMBE NSW 2141
WHARINGTON Capt D H	Asst Nautical Advsr	Dept of Transport	GPO Box 2111S MELBOURNE VIC 3001
WHITLOCK J A	Instruments Off	Experimental Bldg Stn	PO Box 30 CHATSWOOD NSW 2067
WILKINSON R C	Partner	Carr & Wilkinson	56 Neridah St CHATSWOOD NSW 2067
WILLIAMS A	Assoc Prof	Monash Uni	Mech Eng Dept CLAYTON VIC 3168
WILLIAMS P C	Engineer	Dept of Labour & Immigration	Aust Govt Centre Chifley Sq SYDNEY 2000
WINTERS C	Director	Bruel & Kjaer Aust P/L	33 Major's Bay Rd CONCORD NSW 2137
WOOD M		Vipac	504 Pacific Highway ST.LEONARDS 2065
WOODING J C	Engineer	State Electricity Comm Vic	20 Broome Ave MENTONE VIC 3194
YATES A	Works Manager	Kell & Rigby P/L	6/22 Queenscliff Rd QUEENSCLIFF 2096
YOUNG A R	Engineer	Dept of Transport (Air)	Mech Maintenance Dept of Transport (Air) Aviation House BRISBANE QLD 4006