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Acoustics and Europe

European Noise Policy – Some Reservations

Bridget Shield FIOA

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Is Acoustics a Black Art?

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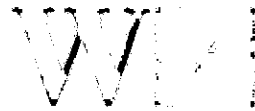
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The Institute of Acoustics was formed in 1974 through the amalgamation of the Acoustics Group of the Institute of Physics and the British Acoustical Society and is the premier organisation in the United Kingdom concerned with acoustics. The present membership is in excess of two thousand and since 1977 it has been a fully professional Institute. The Institute has representation in many major research, educational, planning and industrial establishments covering all aspects of acoustics including aerodynamic noise, environmental, industrial and architectural acoustics, audiology, building acoustics, hearing, electroacoustics, infrasonics, ultrasonics, noise, physical acoustics, speech, transportation noise, underwater acoustics and vibration. The Institute is a Registered Charity no. 267026.

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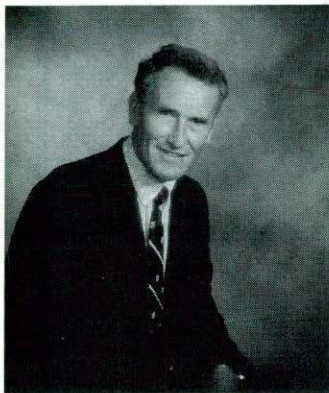
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Dear Fellow Member

As we go to press we have been informed of the deaths of three of our Fellows, Professor Douglas Robinson HonFIOA, Dr John Holmes HonFIOA and Dr John Knight FIOA. Although I did not have the opportunity to work with all of them I think we are all aware of the contribution they made to the science of acoustics and to the life of the Institute. Full testimonials are being prepared by the editorial staff and these will appear in a future issue but for now we send our condolences to their families, friends and colleagues.

The work of the Institute continues; we now have the Secretariat of the European Acoustics Association located in our offices in St Albans. Over the next few years we will be playing a major role in the development of the EAA. With the growing integration of Europe it is important that we put the necessary structures in place to ensure that our members can effectively compete for work throughout the European Union. This means common standards and cross recognition of professional qualifications. The Institute has been active over the years encouraging the development of a strong and broadly based acoustics profession in the UK; this should put us in a strong position to capture work in the expanding markets of the EU. We are fortunate that English is the working technical language of Europe so the last link we have to put in place is the objective we have set ourselves of wider recognition of our professional qualifications. These matters advance slowly due to the lengthy consultation process that has to be undertaken and the widely differing systems used throughout Europe, none the less we have made a start.

The high summer period may be the silly season for the popular press, but for those involved in environmental noise, the decision that many people make to reduce attenuation of their homes to improve ventilation results in them being more directly confronted with the noise levels in our communities. The recent Noise Awareness Day organised by the National Society for Clean Air effectively publicised the problems and pointed to some of the remedies that are available. This kind of pressure group activity is not within the remit of the Institute of Acoustics but we should recognise that they have their place and be prepared to play an active role in providing technical and moral support for these kinds of initiatives.

If you do have a quiet moment may I draw your attention to the letter from Dani Fiumicelli AMIOA published in this issue. It is in response to the short news item carried in the last issue regarding the need for tenants to ensure that the sound insulation of premises they plan to lease is adequate. If you also have a view then please let us know.

For now with kindest regards, I remain

Yours

Ian Campbell

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EUROPEAN NOISE POLICY – SOME RESERVATIONS

Bridget Shield FIOA

Introduction

The European Commission Green Paper [1] published in 1996 proposed a new framework for future noise policy in Europe. The Green Paper estimated that 20% of the EU population (80 million people) suffer from unacceptable noise levels which cause annoyance, sleep disturbance and risk of adverse health effects, while a further 170 million live in 'grey areas' where noise has the potential to cause serious annoyance during the daytime.

The new noise policy framework outlines options for future action to reduce noise from road traffic, rail, air transport and outdoor equipment. In addition the Green Paper includes the following option:

A proposal for a directive providing for the harmonisation of methods of assessment of noise exposure and the mutual exchange of information. The proposal could include recommendations on noise mapping and the provision of information on noise exposure to the public. In a second stage consideration could be given to the establishment of target values and the obligation to take action to reach the targets.

To examine this proposal, working groups were established to consider various aspects of the proposed framework, including the harmonisation of noise indicators and assessment methods, the setting of noise targets, and the introduction of noise mapping of European cities.

This article outlines some reservations of the author concerning the introduction of a common noise policy to be applied to all member states of the European Union, and considers some of the issues and questions relating to the deliberations of certain of the working groups. Several of the points made were raised by the discussion groups at the IOA meeting on the European Noise Policy in January 1999.

Is a European Noise Policy Feasible or Necessary?

The general aim of reducing noise levels as far as possible in order to improve the quality of life for people throughout Europe is obviously to be welcomed. The reduction of environmental noise would improve general living conditions, reduce health problems such as stress caused by noise, and in extreme cases reduce the risk of hearing loss.

However, a major omission in the Green Paper is an explanation of the purpose of a European noise policy. What is the new noise policy for? Most member states already have national policies in the form of standards, guidelines or legislation, so why is it necessary to

develop a new policy? From what has been published so far it does not seem as if a new common policy will offer anything to improve the current situation.

If feasible, the introduction of a new noise policy provides an opportunity to examine and improve on current methods of noise assessment, and to widen the scope of existing legislation and guidelines. A new policy could dispense with the current widespread acceptance of L_{Aeq} as a measure of all environmental noise. Previously disregarded issues such as the needs of elderly and disabled people, the needs of children, or problems of low frequency noise could be addressed. However, if these issues are not considered there is a danger that assessment methods will not be improved, and that the resulting policy will be merely a watered down version of current national policies.

Furthermore, the EU stretches from the Arctic Circle to the Mediterranean. Surely the basic assumption that it is feasible to develop a single noise policy which is appropriate for every member state is flawed, for geographical and cultural reasons.

Variations in climate mean that people have very different lifestyles across the continent. The most pronounced contrasts are those between northern and southern Europe, with people living in southern Europe having a very different structure to the day, and different social habits, from those in northern Europe. Cultural differences contribute further to varying patterns of social activity, and lifestyle. Different expectations of, and attitudes to, noise sources can also lead to variations in response to noise from individual sources.

Given these national variations within the continent, it seems that there are two possible scenarios for a European noise policy. Either there will be one common policy for the whole of Europe, with the same target levels and the same assessment measures, which for the reasons outlined above and discussed further below is unlikely to work. Alternatively, there will be a general overall policy which allows considerable interpretations and developments by the individual member states. If the latter is the case, surely this negates the purpose of a common policy as the situation will be basically the same as at present with individual countries implementing their own policies on noise.

Another concern with the proposal to develop a new EU policy is the relationship of any new policy to the proposed World Health Organisation community noise criteria [2]. If these criteria are adopted by the WHO, then what will be the relationship between the WHO criteria and the new EU policy? If they are the same then there is

no need for an EU policy. If they differ in any respect then which criteria have priority and are to be complied with in a particular situation? Similarly, what will be the relationship between national noise policies and the EU policy? Will national policies have to be abandoned in favour of the EU policy? If not, which policy should be adhered to in any given situation?

Noise Indicators

Working Group 1 was set up in order to advise on a single EU environmental noise indicator. The Green Paper states that the European Commission believes that L_{Aeq} should be the common European index as it is *already the most commonly used exposure descriptor and is gaining world-wide acceptance as the scale for long term noise exposure*.

However, this does not mean that L_{Aeq} is the *best* scale for noise assessment. There has been a considerable body of work in the last few years that has shown that L_{Aeq} is not necessarily a good indicator of community response to noise, particularly when low frequency noise is present or when disturbance is caused by a few isolated events.

The use of the dBA scale underestimates the impact of sound which is biased towards the low frequency region of the spectrum, whereas 'averaging' the sound levels of individual loud events over a period of time gives no indication of the severe impact of each of those events. Dissatisfaction with the sole use of dBA and L_{eq} is evidenced by the increasing use over the last ten years of dBC and L_{max} in guidelines and policies on environmental noise, and by the reintroduction of dBC as a measurement unit on the current generation of sound level meters.

It is therefore important that a new noise policy gives consideration to units other than L_{Aeq} . However, it would appear from the draft position paper of Working Group 1 [3] that L_{Aeq} is likely to be the indicator recommended for general use, although it is suggested that linear or C-weighted L_{eq} is more appropriate when low frequency noise is present.

It seems ironic that the European Commission is proposing the use of the single L_{Aeq} indicator at a time when instrument manufacturers are producing more and more sophisticated instrumentation that can simultaneously measure many parameters and characteristics of noise. Just as more sophisticated tools become available, and complex measurements become more practical, the process of measuring sound is 'dumbed down' by the use of a single figure unit.

The use of a single L_{Aeq} measurement will mean the loss of much potential information. The relationship between different noise indicators such as L_{Aeq} , L_{A10} and L_{A90} can provide useful information about the current noise climate and possible impact of new noise sources. How will arguments involving the use of units other than L_{Aeq} be regarded if indicators based upon L_{Aeq} are the only ones recommended in the EU policy?

The position paper recommends the use of separate indicators for day, evening and night time periods, with

the particular periods being defined by each member state in accordance with local circumstances. However, the definition of, for example, 'evening' varies widely throughout Europe; also, quiet times other than night-time, such as siestas, occur in southern Europe. In order for period L_{Aeqs} to be meaningful across Europe, and applicable in Copenhagen, Corfu, Glasgow and Granada, there would have to be many variations with different time periods defined. Surely the use of many different time periods would make it very difficult to compare or combine levels across national boundaries, and to a certain extent negate the whole point of a common policy.

Dose/Response Relationships

The aims of Working Group 2 are to elaborate the relationships between noise dose and effects (annoyance, sleep disturbance, speech interference), and to propose the setting of targets based upon harmonised dose/effect relationships.

There has been a considerable amount of work carried out in the last few years comparing the results of different dose/response surveys for a variety of noise sources. However, it is very difficult to draw any definite conclusions or to combine the results to produce a single dose/response relationship for one particular noise source or for a combination of noise sources; all noise and social surveys in the past have used different survey techniques, different measurement methods, different response scales, and different terminology.

Apart from these factors, the validity of comparing surveys from different countries must be questioned. The issues of cultural and social variations and differing expectations are again relevant in attempting to define a Europe wide dose/response relationship. Attitudes to noise sources will vary from country to country and may affect the response to the sound. For example, it is possible that people in a country with an efficient, clean, and cheap rail system might be more tolerant of railway noise than those where the train service is inefficient, dirty, and expensive.

Furthermore, assumptions as to what constitutes an acceptable noise level, and what is unacceptable, vary from country to country. For example, in southern European countries most people spend the summer evenings outside with friends and families, and there can be high levels of external noise. This noise would not be tolerated in the UK and would lead to many complaints to EHOs of neighbourhood noise disturbance.

The above factors make the setting of target levels that are appropriate for the whole of Europe extremely difficult if not impossible.

It is also important, in considering the effects of noise and the setting of noise targets, to consider not just those with 'normal' hearing but also those with some form of hearing impairment, particularly children. It is also important to set noise targets with other vulnerable and disabled people in mind. Hearing impaired and visually impaired people find it very difficult to cope with high ambient noise levels and require more stringent criteria

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than people who are not disabled in this way. The percentage of the European population with disabilities, particularly hearing and visual impairments, is going to increase dramatically over the next 20/30 years as the percentage of older people increases. It is important to design noise policies with those people in mind, to improve the quality of life of the whole population.

Finally, when setting noise targets a decision has to be made as to the type of 'target'. For example, should separate noise targets be set for each noise source? Should targets be set in terms of absolute levels, changes in level, comparisons with background levels, and so on?

Computation and Measurement

Another working group, Working Group 3, is concerned with the harmonisation of calculation and measurement procedures for noise assessment, mapping, planning and noise abatement, which are applicable to road, rail, aircraft, outdoor machinery and industrial noise.

This group has been examining different methods of modelling and calculating sound levels. An important factor influencing the group's selection of models as common standard prediction tools is their 'transparency'. Another factor of vital importance in the choice and use of models is the accuracy of predictions, which should have been determined by extensive validation of the models. At present it can be difficult to obtain any information about this aspect of commercial noise prediction packages. It is therefore important that the working group gives careful consideration to the accuracy of the chosen models, and to the extent of their validation. Any model chosen should have been extensively tested in a variety of situations, and shown to work to a given accuracy. Ideally all models being considered should be independently validated over a set of different scenarios. The 'user-friendliness' of the models being considered should also be taken into account.

It is important that users of computer prediction models appreciate the likely inherent errors and do not assume that the predicted levels are wholly accurate. Information on the accuracy and validation of any models should be available to the users. This applies in particular if the models are to be used by non-specialists, as all users need to be aware of the significance of likely error within the models.

The accuracy of models is particularly important if they are to be used for predicting exact values in a given situation; less so if they are to be used for comparative purposes only, for example to examine 'what if...' scenarios.

Many of the European states have different methods of calculating environmental noise such as noise from road traffic, railway noise etc. It is not clear whether all these methods will be standardised into one common method, or whether the models adopted will use the method appropriate for the particular country concerned. If the former is the case, which method will be selected as the 'correct' method; if the latter, then what is the point of having a common model?

The accuracy of computer model predictions depends

very greatly upon the accuracy of the source data. If databases of source levels are to be developed, where will the data come from initially, how will it be measured, who will check that the data is correct, and who will be responsible for maintaining and updating the database?

The propagation of sound over differing ground conditions, and in different meteorological conditions is still the subject of extensive research. Which method will be adopted, given that the reliability of many of the currently used techniques is in doubt?

Another point that has given rise to some concern is the proposal to measure and predict noise levels at a receiver height of 4 m. Surely the receiver height chosen could be flexible, depending upon the particular situation being investigated, and the height of the receiver position of interest. For example, in some cases the effects of barriers will not be apparent at a height of 4 m.

Noise Mapping

The Green Paper proposes noise mapping as a useful tool in strategic planning to reduce noise. Noise maps are to be produced for all urban areas in Europe with a population greater than 250,000. Working Group 4 is responsible for investigating noise mapping techniques in order to provide guidelines to the European Commission for effective mapping. However, although some existing noise mapping packages appear to be very sophisticated, and several cities in Europe already use noise maps, the whole issue of the purpose and feasibility of a general noise mapping procedure raises many doubts and questions.

Given the enormous variation in sound level between one building façade and another in a busy urban environment, it is difficult to understand how an accurate noise map can be produced. As discussed above in relation to computer modelling of sound, it is important that the potential accuracy and validation basis of mapping techniques are understood by their users. In order to ensure that a noise mapping procedure adequately reproduces patterns and trends in noise level, it should be tested in many different cities with many different noise sources. Again, as with modelling of sound, the acquisition and accuracy of source data is essential.

It is to be hoped that noise maps will display units other than L_{Aeq} levels, and be used to give some indication of particularly annoying noise, such as tonal or intermittent noise. As with modelling, it is important to know which calculation methods will be used, and whether current national calculation methods of, for example, road traffic noise will be used to produce the maps.

An important reason for the use of noise maps is to provide a readily understandable way of making information on environmental noise available to the general public. However, there is a danger that the publication of noise maps will increase people's sensitivity to noise. If people see a noise map of their area it is likely that they will immediately start 'listening' to see whether their perception agrees with what is shown on the map. This could lead to increased annoyance and incidence of complaints about noise. If the map shows that someone

lives in a 'noisy' area, then they are likely to become annoyed by the noise, even if they have previously been unaware of it. It is also possible that noise maps will affect property prices and desirability of certain areas, reducing the value of both residential and commercial buildings in 'noisy' areas.

The issue of accuracy becomes increasingly important if maps are to be made available to the general public. If something appears in black and white (or colour, as in this case) then the general assumption is that it must be right. Anyone consulting and interpreting a map needs to know how accurately the map represents the true situation.

Conclusions

In many of the areas discussed above one of the overriding factors appears to be to simplify noise measurement and prediction by, for example, introducing a single number indicator as the standard, and presenting information on noise in a manner which is readily understandable by the 'general public'.

However, should not the role of professional acousticians be to use the most appropriate methods, however complicated, rather than the simplest, to solve problems? In other areas, such as medicine, we assume that the latest technology and knowledge will be available to the general public, and expect the professionals involved to make the correct use of them, and to form a professional opinion based upon their findings. We do not expect a brain surgeon to use a hammer and chisel because it is a simpler and more 'transparent' technique than modern methods.

In view of the issues discussed and questions raised above, it appears that there are many problems to be overcome in developing a European noise policy. The fundamental question is whether it is in fact feasible to have a noise policy covering the whole of Europe, which consists of member states with many cultural and social differences.

The development of a new common policy provides an opportunity for addressing some of the problems of noise assessment that arise when using existing procedures. However, unless the new policy addresses those areas where existing assessment procedures and noise parameters are inadequate, then there is a danger that there will be no improvement, and possibly a worsening of, the overall situation for the majority of Europeans.

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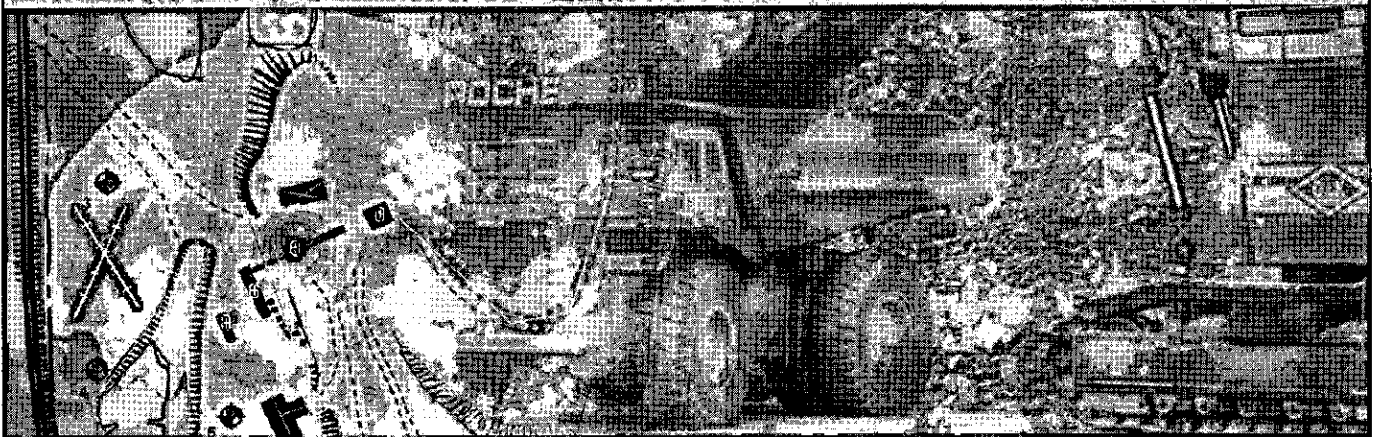
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IS ACOUSTICS A BLACK ART?

Matthew Fisher MIOA

Introduction

Acoustics is a black art is an aphorism often voiced by professionals involved in building design. It is interesting to consider the possible origins of a such a maxim about a science that, whilst complex, is certainly exact. It may be partly attributable to the perceived dearth of sophisticated building acoustics design approaches available and the resulting reliance placed on more traditional 'tried and trusted' design methods.

It is often stated that the acoustic performance of complex constructions cannot be readily predicted with confidence to a high degree of accuracy. Recent IOA presentations on the topic have confirmed that rigorous prediction methods have not been used when the potential sound insulation of floating concrete floors, cavity masonry walls and similar constructions is being considered. Empirical rules of thumb are often used to predict flanking transmission and structureborne noise. This may be a result of the tight margins to which many consultancies work, prohibiting the commitment of resources to the development of more advanced design techniques. However, it will be easier to justify the cost of researching such techniques if appreciable construction cost savings can be demonstrated to clients through the use of more accurate and reliable design practices.

Brevity in design work has not been a great hindrance to the profession in the past. However, the last five years have seen an upsurge in the number of building developments that warrant a more considered approach to acoustic design. Examples of these include mixed developments that house hotels and nightclubs, cinemas and shops, residential accommodation and bars.

There has been a concomitant rise over the same period in the number of floating concrete floors installed in such developments at the behest of acoustic consultants. Where floating concrete floors are installed, independent wall linings are sure to follow. Such constructions are costly to supply and install, but the risk of litigation in case of a failure to supply a design that is fit for the purpose is a strong persuader and surely leads to the inclusion of costly safety margins.

This situation will no doubt perpetuate for some time to come. In the construction of cinemas for example, many designers will have a template for a multiplex development. At completion, it is likely that no work will be done to determine the level of, for instance, flanking transmission, as the project fee may have been exhausted. If the end-user has no complaint about sound insulation, then that template is likely to be used for the next development. It may, however, be the case that constructions were used in the development that were not

required to achieve the specified sound insulation performance. A less costly design solution may have been appropriate.

It should be argued that advanced and accurate design techniques derived from recent research should be increasingly relied upon in preference to rules of thumb and reference to old test data. Developers should be presented with rigorous justification for the expensive constructions that are deemed necessary for their developments.

The focus of this article is the recent implementation of a prediction method that uses Statistical Energy Analysis (SEA) as a framework to determine the sound insulation of cavity constructions and the effect of structureborne sound on the sound insulation between rooms. As was discussed in these pages recently [1], SEA provides a means to assess complex vibroacoustic problems, such as those that are encountered in building acoustics. Comparisons of the method's predictions with test data are presented in order to illustrate its accuracy and demonstrate how this approach can lead to construction cost savings through a better understanding of sound transmission mechanisms within buildings.

Flanking Transmission

There are standard texts which describe the mechanisms controlling sound transmission in buildings [2,3], which are recommended to the interested reader. The methods used by the writer to predict flanking transmission in buildings have their founding in Statistical Energy Analysis (SEA).

The starting point for the prediction of flanking transmission is to determine the acoustically-induced energy of the structures which are common to the rooms under consideration, or which have junctions with structures in any of the rooms. The vibration velocity of these structures can then be determined.

For a complete analysis of flanking transmission, it is necessary to consider the acoustically induced energy level in each room element, from which the total energy of each element is determined. For instance, walls built off a floor will exhibit an energy component due to energy in the floor. Similarly, the energy level in a floor separating two rooms will depend upon the energy in the walls that have a junction with the floor.

The energy level in the structures of the receiving room will depend upon the coupling loss factor (CLF) from elements of the source room to the elements of the receiving room. The CLF depends upon the type of structural joint, the material properties of the elements, the dimensions of the elements and the frequency of interest.

The radiated sound level due to the energy in the

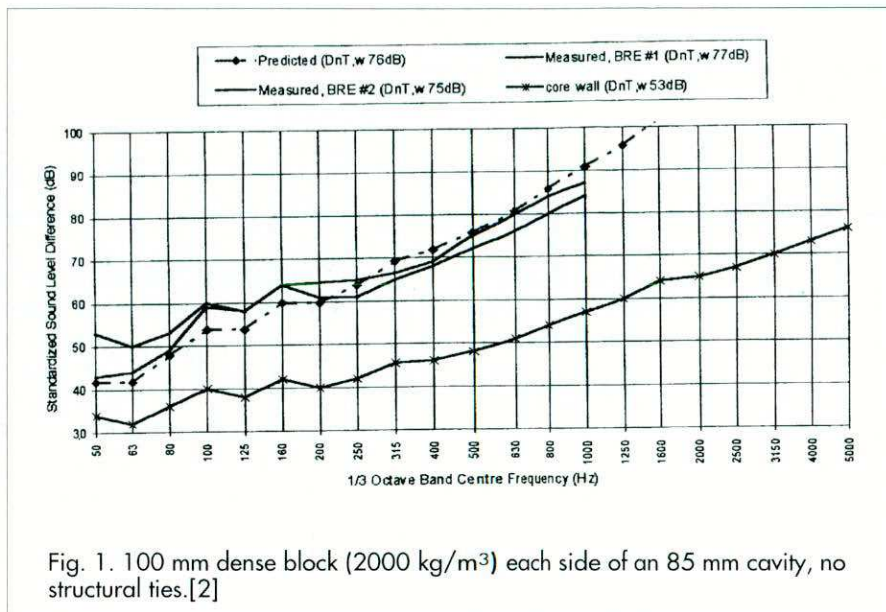


Fig. 1. 100 mm dense block (2000 kg/m³) each side of an 85 mm cavity, no structural ties. [2]

receiving room elements can then be calculated, thereby facilitating calculation of the overall sound level difference between the spaces under consideration.

Reduction of Flanking and Direct Transmission

Implementation of the basic flanking calculation procedure allows the prediction of flanking transmission for scenarios such as concrete shell structures with no additional wall linings, ceilings or floating floors. In order to determine the effect that such items have on flanking and direct transmission, it is necessary to determine the reduction in energy (or vibration) level of the structural elements that a lining achieves.

A fundamental determinant of the behaviour of cavity constructions is the mass-spring mass resonance frequency, which can be calculated, [2], using:

$$f_0 = \left\{ \frac{1}{2\pi} \left[\left(\frac{K}{\rho_{s1}} \right) + \left(\frac{K}{\rho_{s2}} \right) \right] \right\}^{1/2}$$

Where

K = stiffness per unit area of air plus any ties or mounts in the cavity and ρ_{s1} and ρ_{s2} are the surface masses of the two leaves.

$$K_{air} = \frac{1.4 \times 10^5}{d}$$

Where d = depth of cavity in metres [2]
If absorption, such as mineral wool, is installed in the cavity, then K_{air} reduces to, [2]

$$K_{air} = \frac{1.0 \times 10^5}{d}$$

Craik and Wilson [4] have measured and published the stiffness of various types of wall tie.

An expression for the vibration velocity level difference between two infinitely large parallel plates separated by an air layer is given by Cremer et al [2] as:

$$\Delta L_v = 40 \log \left\{ \frac{f}{f_0} \right\}$$

However, this is known to grossly over-predict the level difference in a real structure [3]. SEA provides a more reliable method for predicting the level difference between two leaves of a wall, with or without structural connections and damping in the cavity.

The principles of SEA have been used by the writer to develop a simple method for the prediction of the performance of cavity constructions. The method requires less set-up time and computing power than a full SEA analysis.

Comparison of Measured and Predicted Values – Cavity Constructions

To determine the reliability of the prediction method, a number of cavity constructions have been modelled and the predicted values compared with measured values.

Cavity Walls

The constructions shown in Figures 1 – 3 have been modelled and the predicted performance compared with laboratory test data.

The predicted values are in good agreement with the experimentally determined values. The measured and predicted weighted level differences are within 1 dB. The frequency dependent trends for the three constructions are also predicted.

Of particular interest is the performance of the cavity block wall with butterfly ties connecting the leaves (Figure 2). Below 500 Hz, the performance of this wall is not significantly worse than the wall with structurally isolated leaves. This is to be expected given the relatively low stiffness of butterfly ties. It is only at upper frequencies

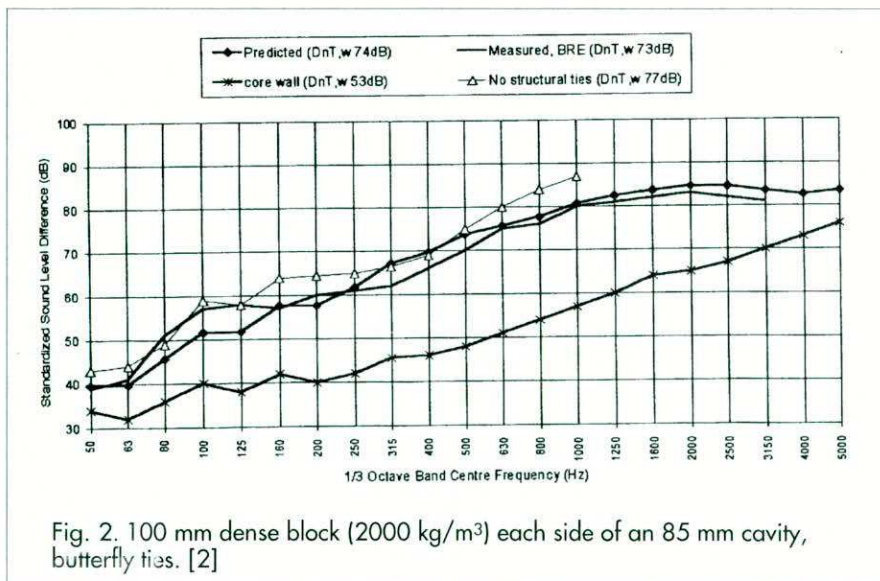


Fig. 2. 100 mm dense block (2000 kg/m³) each side of an 85 mm cavity, butterfly ties. [2]

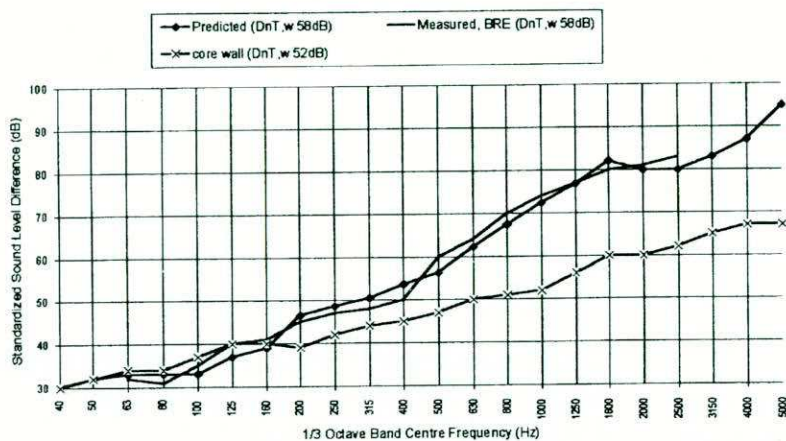


Fig. 3. 100 mm dense block (2010 kg/m³) with a dry lining of 2 x 3 mm plywood on a 100 mm cavity. [2]

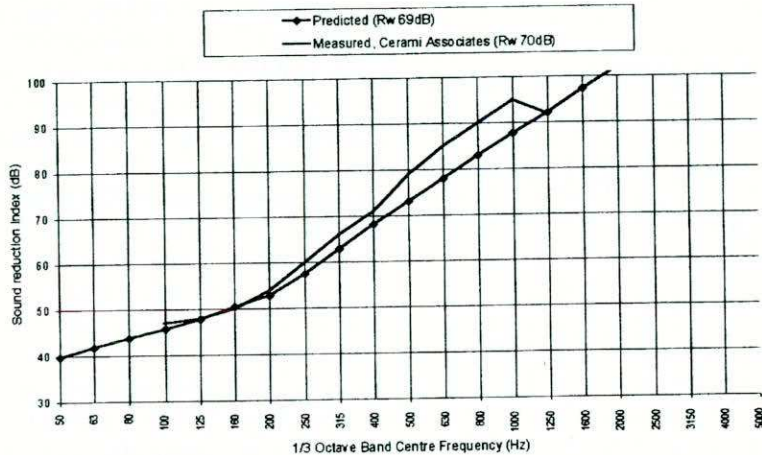


Fig. 4. 140 mm structural concrete floor (1700 kg/m³), 100 mm floating concrete layer (2440 kg/m³) supported on Mason jack-up mounts of natural frequency 9 Hz, to create a 50 mm cavity.

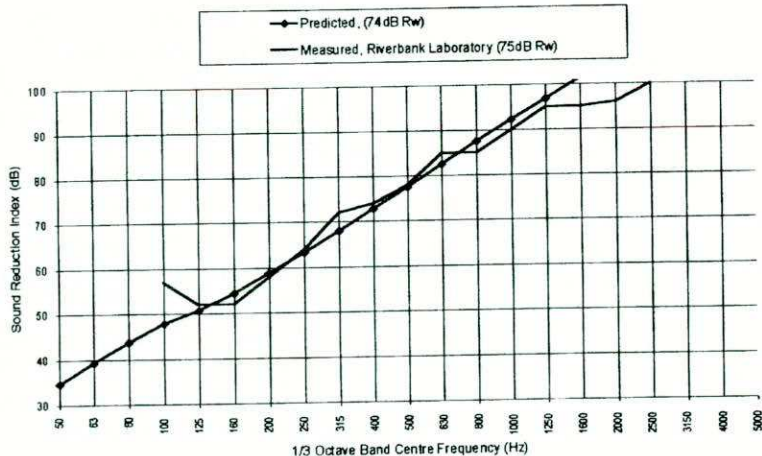


Fig. 5. 150 mm structural concrete floor (2440 kg/m³), 100 mm floating concrete layer (2440 kg/m³), supported on Kinetic floor system mounts of approximate natural frequency 13 Hz, to create a 50 mm cavity.

that the ties adversely affect the acoustic performance of the wall.

It is common practice to specify relatively expensive resilient sway braces as wall ties when designing masonry cavity walls intended to achieve high sound insulation. It is apparent that such devices, which are designed to decouple the wall leaves, do not markedly improve the sound insulation of constructions at low frequency. Additionally, the performance of the wall at high frequency with butterfly ties may be quite adequate for the particular application.

The above conclusion depends on the cavity size. If the cavity size is greater than 100 mm and mineral fibre is installed in the cavity, then the stiffness of a butterfly tie becomes greater than the stiffness of the air in the cavity and the tie adversely affect the acoustic performance at all frequencies. (BS 1243:1978 should be consulted when considering the use of butterfly ties in large-cavity walls.)

The prediction method therefore allows a cost-versus-performance exercise to be carried out.

Floating Concrete Floors

The construction forms shown in Figures 4 and 5 have been modelled and the predicted performance compared with measured values.

Again the predicted values are in good agreement with the measured results; the measured and predicted weighted sound reduction indices are within 1 dB.

The natural frequency of the floor mounts tends to dominate design considerations for floating concrete floors. However, the stiffness of the air in the cavity plays a major role in the acoustic performance of such floors. For instance, if a 100 mm concrete slab is to be floated 50 mm above a 200 mm structural slab and the natural frequency of the floor mounts is designed to be 10 Hz, then the mass-spring-mass frequency of the system will be 23 Hz. If the natural frequency of the floor mounts is designed to be 16 Hz, then the mass-spring-mass frequency of the system will rise slightly to 26 Hz. The influence on the acoustic performance of such an increase in the mass-spring-mass frequency is expected to be of

the order of only 1 dB.

The influence of the size of the cavity can also be determined. If the cavity size of the above example is increased to 100 mm and the natural frequency of the floor mounts is designed to be 10 Hz, then the mass-spring-mass frequency of the system will be 18 Hz. The predicted improvement, above 40 Hz, over the example with a 50 mm cavity and 10 Hz floor mounts would be just over 2 dB.

Floors Underdrawn by Ceilings

The construction forms shown in Figures 6 and 7 have been modelled and the predicted performance compared with measured values.

The ceilings were modelled with the air in the cavity as the only determinant of the stiffness connecting the two leaves of the construction, ie any stiffness relating to the metal strap hangers of the MF system was not included.

The close agreement with the measured values indicates that the strap hangers provide a weak transmission

path and do not adversely affect the airborne sound insulation of the construction. This result is in accord with an investigation of point connections between lightweight linings and masonry walls [5].

It is common practice in the profession to specify isolation hangers for ceilings that underdraw masonry floors in an effort to achieve the maximum potential sound insulation of the construction. To the author's knowledge, no research or measurement regime has ever been undertaken which confirms the necessity of such a provision.

Comparison of Measured and Predicted Values – Site Test Data Including Flanking Transmission

Using the principles of Statistical Energy Analysis, a computer model has been developed which allows the prediction of the sound level difference between rooms to be calculated, including all structural flanking paths. The computer model implements the writer's method for predicting the performance of cavity constructions.

A number of existing rooms have been modelled and the results compared with measured data, as shown on Figures 8 – 11.

Music Practice Rooms (Figure 8)

Principal constructions:

Party wall 225 mm brickwork each side of 350 mm cavity. Each brickwork wall built off floating concrete floor

Structural floor 200 mm concrete

Floating floor 100 mm concrete slab on 50 mm neoprene mounts of natural frequency 12 Hz

Structural soffit 300 mm concrete

Ceiling 25 mm plaster on expanded metal lath, suspended 150 mm from soffit

Side walls lining of 225 mm brick built off floating slab to create 100 mm cavity from outer brick walls

The measured sound level differences between the brass and percussion rooms at the Central London Music College are some of the highest recorded in such buildings. The predicted results at one-third octaves are very close to the measured results at all frequencies below 400 Hz except 200 Hz. The anomalous dip in performance at this frequency cannot be explained either by the acoustic designers involved or the writer.

It is interesting to note that the predicted first cross-cavity mode is 490 Hz and that above this frequency, the measured results exceed

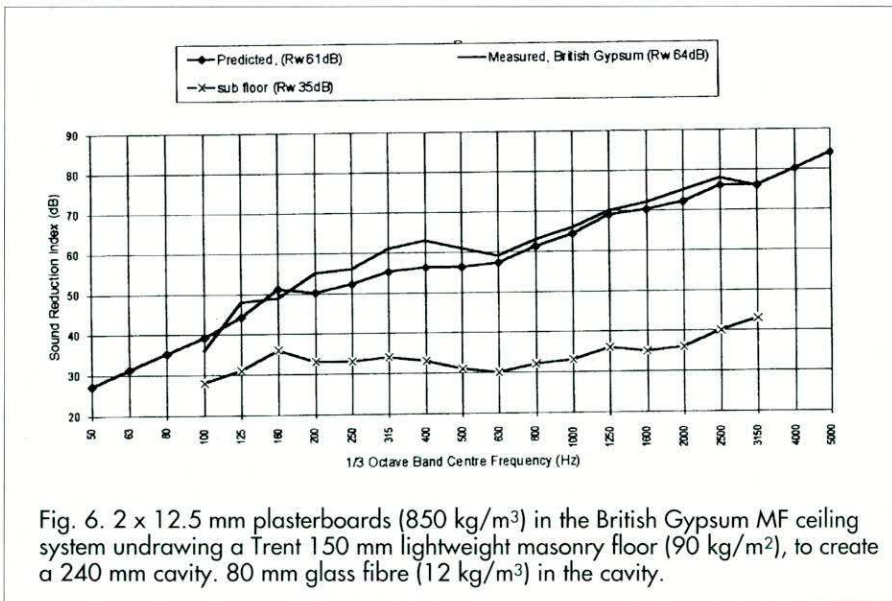


Fig. 6. 2 x 12.5 mm plasterboards (850 kg/m³) in the British Gypsum MF ceiling system undrawing a Trent 150 mm lightweight masonry floor (90 kg/m²), to create a 240 mm cavity. 80 mm glass fibre (12 kg/m³) in the cavity.

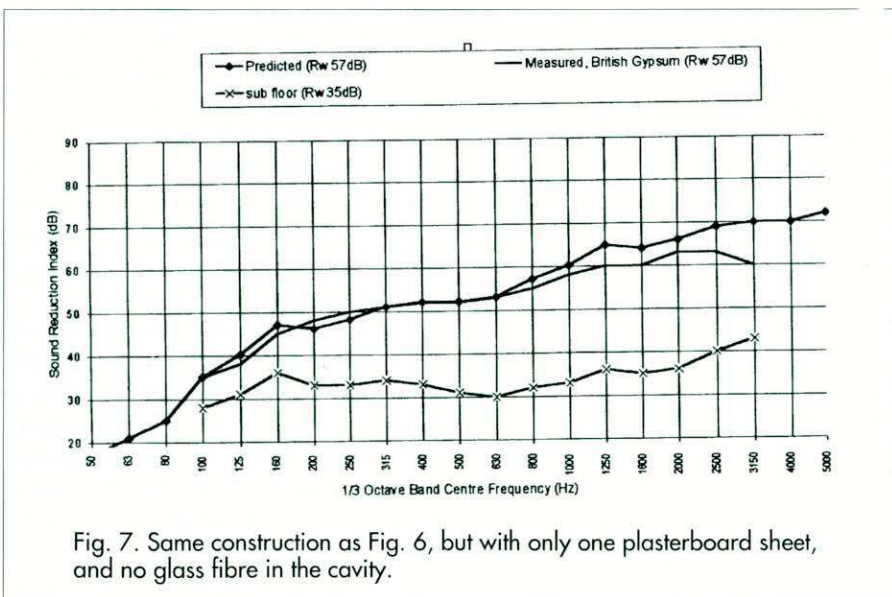


Fig. 7. Same construction as Fig. 6, but with only one plasterboard sheet, and no glass fibre in the cavity.

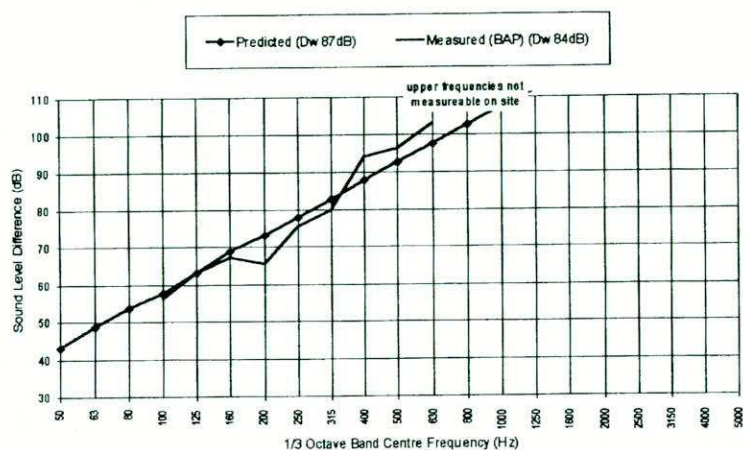


Fig. 8. Music practice rooms, Central London Music College (Courtesy of Bickerdike Allen Partnership).

the theoretical performance. Below the cross-cavity modal frequency, all acoustic wave motion in the cavity is parallel to the wall.

Above this frequency, and because there are no other strong structural connections, the two leaves become effectively decoupled from each other and the cavity can be expected to become a reverberant volume. The performance of the construction form will then be influenced to a certain degree by the acoustic absorption in the cavity.

Cinemas (Figure 9 and 10)

Principal constructions (Figure 9):

Party wall 190 mm thick solid concrete block wall (minimum density 2000 kg/m²), lined in auditorium 1 with independent wall lining of 2 x 12.5 mm wallboard and 1 x 19 mm gyproc plank, spaced 196 mm from the block wall, 100 mm Gypglas in the cavity; lined in auditorium 3 with 2 x 12.5 mm wallboard on MF channels to create 25 mm cavity

Structural floor 360 mm thick concrete

Internal wall 140 mm thick solid concrete block wall

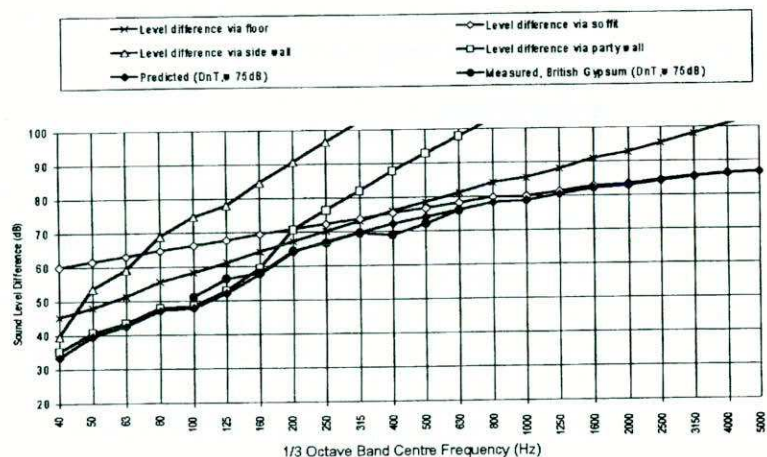


Fig. 9. Auditoria 1 to 3, Nene Park, Northampton (Results published by British Gypsum, acoustic consultant not known).

lined on the auditorium side with independent wall lining of 2 x 12.5 mm wallboard and 1 x 19 mm gyproc plank, spaced 140 mm from the block wall, 100 mm Gypglas in the cavity

External wall 350 mm blocks lined internally with 2 x 12.5 mm wallboard on 92 mm studs, 100 mm Gypglas in cavity

Soffit Steel corrugated roof deck. NB - continuous over party walls.

The predicted weighted sound level difference differs from the measured value by only 1 dB. There is a small under-estimation of the performance at 100 Hz and 125 Hz. The predicted mass-spring-mass resonance frequency of the lining to the

auditorium wall on only a 25 mm cavity is 95 Hz and this affects the predicted performance of the party wall at and around this frequency. It is probable that such linings on small cavities fixed rigidly to masonry walls by MF channels do not vibrate as readily at resonance as can be expected of independent linings.

The breakdown of the various contributions of the structure to the overall sound level difference again allows a cost-versus-performance assessment to be carried out. For instance, the sound level difference due to flanking sound in the internal wall is predicted to be 20 dB better than the overall performance above 63 Hz and 30 dB better than the overall performance above 315 Hz. The wall lining to the internal wall could therefore have been reduced in specification and cost without affecting the final result.

The test report published by British Gypsum states that the continuous steel roof soffit was sprayed with a damping compound. It has recently been confirmed that this was not actually applied in the final construction. The steel soffit was modelled with the same internal damping as masonry. The damping would be provided by the densely-packed mineral wool between the inner and outer layers of the roof. The damping factor used seems to be vindicated by the close correlation between the measured and predicted results.

Principal constructions (Figure 10):

Party wall British Gypsum twin frame metal stud wall consisting of Gyproc 92S12 metal studs set 180 mm apart. Each side of metal frames lined with 2 x 12.5 mm wallboard and 1 x 19 mm gyproc plank. 100 mm Gypglas and 100 mm RW3 Rockwool in the cavity.

The predicted weighted sound level difference is the same as was measured.

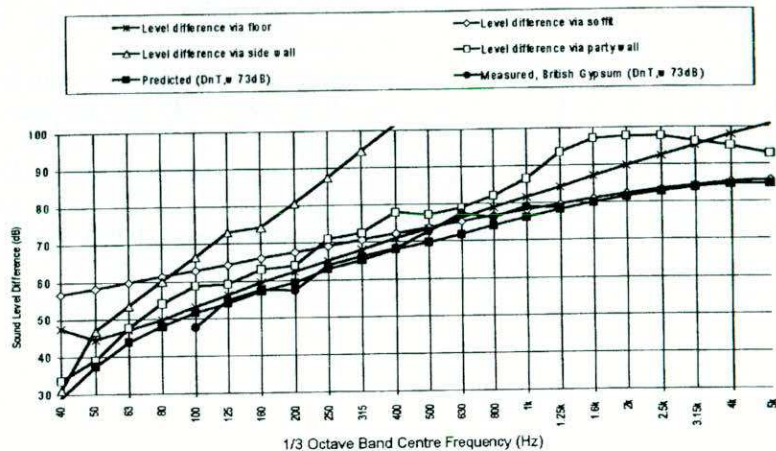


Fig. 10. Auditoria 3 to 5, Nene Park, Northampton (acoustic consultant not known).

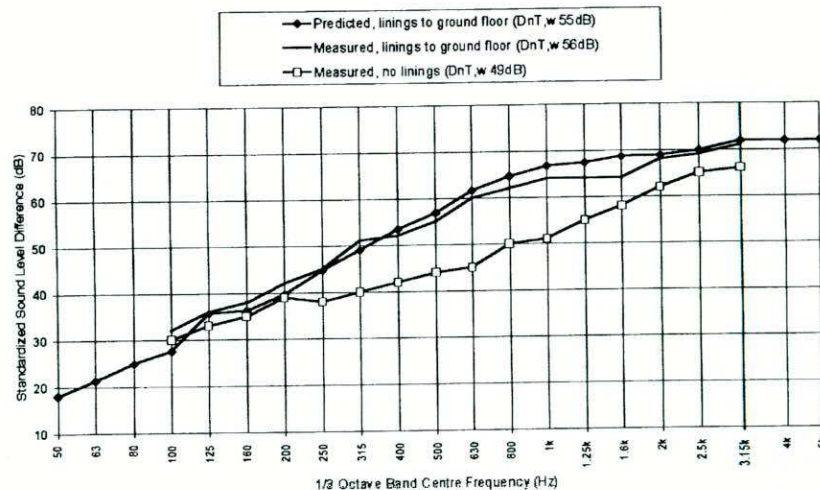


Fig. 11. Timber floor spanning continuous masonry walls.

Many cinema operators require a minimum weighted sound level difference between auditoria of 65 dB $D_{nT,w}$. The measured performances at Nene Park were 73 dB $D_{nT,w}$ and 74 dB $D_{nT,w}$. It is therefore apparent that the constructions identified above could be reduced in specification while still delivering a final product that would meet the requirements of most operators. The implementation of the prediction method under discussion allows the fine-tuning of a specification to deliver a cost-effective design.

Conversely, if the requirements of operators were to increase, for instance at low frequency to meet the demands of the THX specification, then the model allows particular sound paths to be individually assessed and improved if required.

Dwelling – Timber Floor (Figure 11)

In 1990, the Timber Research and Development Association, as part of a wider study on timber frame structures, published the results of acoustic tests on timber floors in an otherwise masonry structure [6]. As part of the tests, the effect on flanking transmission of plasterboard linings

to the masonry walls was investigated.

Principal constructions:

Party floor Walking surface – 18 mm t&g cement bonded chipboard, bonded to 30 mm Rockwool Soundslab, on 18 mm t&g chipboard. Timber floor joists at 600 mm centres, 100 mm mineral wool between joists. Ceiling of 19 mm Gyproc plank & 12.5 mm plasterboard.

Flanking walls 3 no. 100 mm concrete block (1080 kg/m³)
1 no. 215 mm concrete block (1950 kg/m³)

Wall lining To ground floor walls – 12.5 mm plasterboard on independent studs, 60 mm mineral wool in cavity

Structural floor 100 mm concrete on approximately 200 mm consolidated hardcore.

The predicted results closely match the measured performance. It is known that at low frequencies, the presence of floor joists affects the transmission of noise in masonry walls past a timber floor [3]. The model includes an empirical correction for this effect.

Conclusion

Acoustics is not a Black Art.

Scientific principles describe the behaviour of structures and materials. There is a wealth of information in the literature that enables the accurate prediction of the acoustic performance of buildings. With suitable

financial commitment, it has been possible to develop a prediction system that obviates the need to refer to construction templates and rules of thumb. Clients can be offered robust advice in the knowledge that unnecessary expense is not being incurred.

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25th ANNUAL REPORT OF THE COUNCIL 1998

Summary

The Institute is the professional body representing acoustics in the United Kingdom, and provides a range of services for members. This includes publishing the bi-monthly Acoustics Bulletin and an annual Register, organising meetings and conferences, and providing courses for the Diploma in Acoustics and Noise Control, the Certificate of Competence in Workplace Noise Assessment, the Certificate of Competence in Environmental Noise Assessment, and the Certificate of Competence in Measurement of Sound Transmission in Buildings. Membership has grown slightly by comparison with the previous year, and as usual a varied programme of meetings has been sustained throughout the year. Library services have continued to be developed, and the Institute's Web Site is now a well established source of information. During the year the new Buyers' Guide has been developed for publication early in 1999. The Institute's voluntary CPD scheme is now well established with some 10% of the membership taking part. Further progress has been made during the year in respect of the registration of Chartered and Incorporated Engineers, and international activities have included participation in the European Acoustics Association and I/INCE. 1998 was the first full year with Roy Bratby in charge of headquarters activity as Chief Executive, which included the successful transfer to our new home at 77A St Peters Street, St Albans, and the introduction of a new computer system. The Institute is pleased to record its gratitude for the energetic support provided by all its headquarters staff.

Standing Committees

The operation of the Institute is guided by Council through Standing Committees concerned with Membership, Meetings, Publications, Education, and Medals & Awards. There is also a Committee of the Engineering Division.

Membership Committee

There have been several changes in the membership of this committee during the year. Alex Burd has retired from the chair after long service but remains as a member, thus availing the benefit of his experience. His successor is J R Dunn, who joined a few years ago as providing knowledge on the Underwater Acoustics interests. Stuart Bennett has retired due to pressure of work and Ralph Weston has joined in his place with familiarity on matters of Environmental Health. Geoff Kerry, having relinquished his ex-officio membership, continues with us as an ordinary member. The committee met four times during the year in the ordinary course of business to consider applications for membership. A total of 232 individual applications for membership ab initio or for transfer were considered, of which 216 (73 corporate and 143 non-corporate) were approved. Of the applications,

60 were for transfer between grades, 6 for reinstatement, and 166 were applications from non-members. Of the wholly new members, 19 were approved as Members, 107 as Associate Members, 11 as Associates and 13 as Students; in addition 8 Sponsoring Organisations applied and were approved. Offset against this increase was the loss of members being removed from the Register for a variety of reasons. Overall there has been a small increase in membership during the year. Positive steps are now being taken to increase membership, for example on the one hand by automatically contacting all non-members attending our Conferences, and on the other by taking a detailed look at the reasons why members leave. Another aspect of the Committee's work is concerned with the Institute's Code of Conduct. In a difficult case, a Tribunal was set up to consider the issues; it is expected that the proceedings will be completed early in 1999. Two minor cases were dealt with by Chairman's action; one concerned intellectual property rights and the other related to alleged misrepresentation of qualifications.

Grade	1997	1998
Hon Fellow	18	17
Fellow	229	232
Member	1237	1257
Associate Member	613	637
Associate	138	125
Student	54	53
Totals	2289	2321
Key Sponsor	3	3
Sponsor	18	23
Institutional Subscriber	1	4

Table 1. Institute Membership

Employment Category	1997	1998
Architectural Practice	14	11
Consultancy	600	581
Industry/Commerce	302	289
Education	220	207
Public Authority	493	463
Research & Development	198	194
Other	65	59
Retired	80	73

Table 2. Details of Employment

Meetings Committee

Under the new chairmanship of Stephen Turner, the Meetings Committee continued its role of promoting meetings and conferences. Eleven main meetings were held during 1998, including the Spring Conference at Cranfield, the two Autumn Conferences at Windermere (Reproduced Sound 14 and Speech and Hearing) and

the annual Underwater Acoustics conference at Christmas. In addition, there was a diverse range of one-day meetings and workshops. When combined with the 36 meetings held over the year by the Branches, the Institute can boast an average of 4 meetings/month, which is a very healthy state of affairs! In 1999, we are looking forward to the 25th Anniversary Meeting to be held in May where, possibly uniquely, the full range of disciplines of the Institute will come together in one place. However, after many years, the Autumn Conferences will not be held in Windermere; changes in management at the Hydro Hotel have caused us to make alternative plans. The committee can't run without the support of Roy Bratby and the HQ staff nor without sterling work being carried out by our secretary, Jeremy Newton, to all of whom thanks are due.

Topic, Date & Venue	Attendance
Acoustics 98, Transportation Noise 31 March – 2 April, Cranfield University	107
Construction Noise & Vibration 22 April, Church House, London	53
Good Practice in Acoustical Measurements 9 June, South Bank University, London	53
PPG24, Where to Now? 17 June, Aston Business Park, Birmingham	41
Underwater Acoustic Calibration & Measurement 20 – 21 July, NPL, Teddington	50
Measurement of Sound Transmission in Buildings 9 September, BRE, Watford	24
Acoustics in Schools 23 September, Commonwealth Institute, London	49
Reproduced Sound 14 22 – 25 October, Hydro Hotel, Windermere	67
Noise from Pubs and Clubs 11 November, University of the West of England	60
Autumn Conference, Speech & Hearing 12 – 15 November, Hydro Hotel, Windermere	61
Sonar Signal Processing 20 – 23 December, Hotel Prince Regent, Weymouth	70

Table 3. Meetings and Attendance in 1998

Publications Committee

The range of publications provided by the Institute as a service to its members has continued to expand in 1998. Acoustics Bulletin has continued to be produced six times a year, containing articles and information of general interest to the professional acoustics community and news of Institute affairs. The Institute Register is now well established as the means of easily identifying and locating Institute Members and Sponsor Members and the companies or consultancies they work for. The Bulletin and Register continue to be ably produced by Cathy Mackenzie Management Services under the direction of the Management Board appointed by the Publications Committee. The Institute's Web Page has evolved and settled as an easily accessible source of much Institute based information. Recent new features on the site include an electronic version of the Bulletin Blue Pages,

an electronic membership enquiry form, and job opportunity notices. Finally, we have initiated the new Buyers' Guide, a resource for locating suppliers of goods and services relevant to acoustics and acousticians, and the first edition will be distributed to members shortly. As potential advertisers begin to realise the benefits of this publication, we anticipate the Buyers' Guide will grow in size and usefulness.

Education Committee

In 1998, 150 candidates studied at 8 centres for the award of the Institute's Diploma in Acoustics and Noise Control, including students for the Institute's tutored distance learning programme. The overall pass rate in the examinations was 86%, including projects. At the three examinations held in February, May and October, 136 candidates were awarded the Certificate of Competence in Workplace Noise Assessment. Following the examinations in June and October, 119 candidates were awarded the Certificate of Competence in Environmental Noise Measurement. During the year the new Certificate of Competence in Measurement of Sound Transmission in Buildings was offered for the first time on a pilot scheme basis, with 4 candidates awarded the Certificate.

Medals and Awards Committee

The Institute's premier awards presented during the year were the Rayleigh, A B Wood and Tyndall medals. Prof W A Ainsworth received the 1998 Rayleigh Medal at the Autumn Speech and Hearing Conference, where he gave his medal lecture *Pitch and the perception of speech sounds*. Dr G B Deane of the Scripps Institute of Oceanography, La Jolla, USA delivered his 1997 A B Wood medal lecture entitled *Bubbles and the sound of breaking surf* at the Sonar and Signal Processing Conference organised by the Institute's Underwater Acoustics Group in Weymouth. The 1998 Tyndall medal was awarded to Mr J E T Griffiths of Symonds Travers Morgan who presented his lecture *Acoustic performance of entertainment venues for the millennium* at the Institute's Acoustics 98 Conference at Cranfield University, where an Honorary Fellowship was presented to Cathy Mackenzie. Another Honorary Fellowship was presented to Prof F Fahy at the Reproduced Sound 14 Conference. As usual the full citations have been published in Acoustics Bulletin. The Institute's Prize for Best Overall Performance in the 1998 Diploma examinations was won by Miss G D Conroy from NESOT. The Association of Noise Consultants' Prize for Best Diploma Project for 1996/97 was awarded to Mr C Hickin from Derby University. The award for the best poster session at Acoustics 98 went to Mr C Murray of the RAF. The committee is continuing with its deliberations in respect of the awards for 1999 and is always pleased to receive nominations from members. Following on from the development of our contacts with the Engineering Council, the committee has had its remit widened to include the nomination of members for National Awards as part of the New Year and Queen's Birthday lists.

Engineering Division

1998 has been a year of change for the Engineering Division. Dennis Playle, who joined the Institute as its first

MEETING NOTICE

HAS NOISE AT WORK WORKED?

(Organised by the Industrial Noise Group)

Chamberlain Tower Hotel, Birmingham

Wednesday 13 October 1999

The aim of the meeting is to review the progress made in the last ten years and develop the acoustic industry's view of the way ahead.

Programme

Keynote Address • *Dr Peter Graham, HSE*

Changes in noise policy • *Trevor Benn, HSE*

An insurance industry view • *Dr Andrew Auty, Loss Prevention Council*

The new challenges of noise at work • *Joe Saxton, RNID*

Certificate of Competence in Workplace Noise Assessment – delivery of training over ten years and an example of its industrial application • *David Bull, Colchester Institute & dB Acoustics and Andrew Nicholls, Southern Water*

Management of the regulations and financial benefits – an industry view • *Lee Knowles, Rank Hovis McDougall Ltd*

Noise at work issues for orchestral musicians • *Simon Kahn, Bits and Pieces*

Does wearing hearing protection prevent deafness? • *Rosie Hayes, Hear and There*

Title to be agreed • *Deepak Prasher*

Has Noise at Work Worked? - Wednesday 13 October 1999

Name:

Organisation:

Address:

Tel:

Fax:

email:

Please register me as a delegate. I enclose a cheque for the delegate fee:

Member £95 + VAT = £111.63 Non-Member £125 + VAT = £146.88

*Cancellations received after 30 August will be payable in full.
Please return this form to the Institute of Acoustics*

Institute of Acoustics, 77A St Peter's Street, St Albans, Herts AL1 3BN
Tel 01727 848195 Fax 01727 850553 email ioa@ioa.org.uk Registered Charity No 267026

CALLS FOR PAPERS

Measurement and Instrumentation Group

Two-Day Conference

MEASURING NOISE OUTDOORS

17-18 February 2000, Home Counties Venue

Papers are sought on any aspect of measurement of noise outdoors. Tutorials and workshops sessions will form part of the conference with the emphasis on practical measurements.

Meeting Organiser:

Martin Armstrong MIOA, Brüel & Kjær, Harrow Weald Lodge, 92 Uxbridge Road, Harrow, HA3 6BZ Tel: 0181 954 2366 Fax: 0181 954 9504 email: martin.armstrong@bkgb.co.uk.

One-Day Meeting

THE ACOUSTIC DESIGN OF CINEMAS AND LARGE LEISURE COMPLEXES

19th January 2000, London Venue

There has been an enormous growth in the building of large leisure complexes in recent years. These often contain a mixture of noise-sensitive and noise-producing activities, including cinemas, nightclubs, bowling, theme pubs and general retail. Resolving these potential conflicts presents the acoustic designer with a major challenge.

It is intended that the one-day meeting include a visit to the recently opened IMAX cinema at Waterloo. Topics to be discussed in the meeting could include:

- Criteria for sound insulation between cinemas
- Control of flanking sound between noisy cinemas
- Contractual strategies for dealing with inter-tenancy sound insulation and noise control
- Sound insulation and absorption from metal roof constructions
- In-situ sound insulation testing between incomplete constructions
- Low frequency sound insulation – blockwork vs. plasterboard

If you would like to contribute as a delegate or presenter, please contact the organiser. Numbers for the IMAX visit will be limited, so please register your interest as soon as possible.

Meeting Organiser:

Nick Boulter,

Arup Acoustics

St Giles Hall

Pound Hill

Cambridge CB3 0AK

Tel: 01223 355033, Fax: 01223 361258, E-Mail: nick.boulter@arup.com

MEETING NOTICE

Organised by the Electroacoustics and Speech Groups

SPEECH INTELLIGIBILITY

Portland Thistle Hotel, Manchester

Thursday 21 October 1999

Programme

Overview of speech intelligibility

Peter Barnett, AMS Acoustics

Coloration and speech perception

Antony J Watkins, Reading University

Intelligibility vs. quality in objective speech performance assessment

Mike Hollier, BT Labs

Issues of intelligibility in forensic recordings

Peter French, J P French Associates

Speech Intelligibility in classrooms

David MacKenzie, Heriot Watt University

Speech Intelligibility in arena and stadia

Rajesh Patel, Arup Acoustics

Objective testing in practice

Peter Mapp, Peter Mapp Acoustics

Subjective testing in practice

Helen Goddard, AMS Acoustics

Proposals for a new subjective testing method

Peter Barnett, AMS Acoustics

Technical Programme Organisers:

Electroacoustics Group, Peter Barnett Speech & Hearing Group, Stephen Cox

Speech Intelligibility - Thursday 21 October 1999

Name:

Organisation:

Address:

Tel:

email:

Fax:

Please register me as a delegate. I enclose a cheque for the delegate fee:

Members £95 + VAT = £111.63 Non-Members £125 + VAT = £146.88

Cancellations received after 1 September will be payable in full.

Please return this form to the Institute of Acoustics.

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EDUCATION

Certificate of Competence in Workplace Noise Assessment

The following were successful in the May 1999 examination

Amber Newbury, D Richards, L R Thacker, T	Knight, A Lawley, D Tisbury, R C	Donnelly, E Eckford, J D Mitchell, M Ramsay, L Scott, B J Smith, S D Stewart, J Sullivan, A J Woods, W D	Liverpool Collins, A P Lawrence, C J Watson, M W	NESCOT Hatton, B G
Bristol Burgess, G C Martin, P A Pegler, T M	Derby Clements, T Cunningham, M Huck, A Smith, D E	Leeds Dennis, S L Rowley, A	Loughborough Ball, C R Gdaniec, S Howcroft, S Lammin, M J Sales, J Walsh, S K Wilson, G	Staffs Clement, P R Higginbottom, S J Mole, S J Parsonage, D A
Colchester Evans, D A P Fitcher, I	Glasgow Boyd, C C Doherty, M			

Certificate of Competence in Environmental Noise Measurement

The following were successful in the June 1999 examination

Bell College Brewster, D L Brown, C R Clark, C Evans, R Fraser, C Mackinnon, I A Martin, S J McCormick, I A Noble, A H Reid, J Robertson, M Sievwright, K A	Bristol Bryant, A Grattan, R G James, N M Johnson, C A Morgan, D J Morgan, N A Wall, J D	Mottram, C J Quinn, L Richards, A Sharma, R Wilson, J	NESCOT Cope, S L Davis, E Doohan, S Fitzgerald, P J Harlow, K G Hopkins, R C Johnson, B Jones, C M Moore, J D Oladipupo, O Ong, P C H Parlour, L M Rainbow, P A Sotunde, O O	Ulster Breen, M Butler, J Cooke, D Dowling, N Holmes, J Houston, K R Monahan, B Sheriff, D Yorke, R
Birmingham Brewster, D Russell, A D	Colchester Balsom, M Cox, M Farmer, S M Jones, A L Kayani, R Leach, M D Morgan, A	Derby Adetunji, J Astill, L Burns, T Dean, M J		
		Leeds Gray, N J		

MEMBERSHIP

The following were elected to the grades shown at the Council meeting on 17 June 1999

Fellow Cross, R C	Greene, C J Hobby, B R Huson, W L Mackay, F C Nunn, D G Passmore, A Pritchard, J Saleem, M Simpson, K D Whitfield, A Zacharov, N V	Bows, R Carleton, P Deedman, R N Digby-Taylor, R S Garlick, J W Harvey, R J Joselyn, S A Keating, M P Moore, A Niaounakis, T Nichols, H C Owen, A D Qi, N Sheikh, A G	Staite, M
Member Adamczyk, E Austin, M J Bird, A L Broner, N Chan, T M Chiu, Y H E Chung, W L Dixon, A K Fearnside, P R Findlay, A G	Associate Member Aitchison, M J		Associate Ball, M C Chan, C K Elliott, P A Kushwaha, M Orme, S C Ross, C D Westley, C J
			Student Pugsley, A N Robinson, L P



INSTITUTE OF SOUND AND VIBRATION RESEARCH

SHORT COURSES - 1999/2000

6-10 September	Bayesian Methods in Signal Processing
6-8 September	Engine Noise
8-10 September	Vehicle Noise and Vibration
13-17 September	Advanced Course in Noise and Vibration
20-22 September	Introduction to Mechanical Instrumentation and Measurement Techniques
23-24 September	Railway Noise and Vibration
18-22 October	Introduction to Signal Processing
15-19 November	Sonar and Array Signal Processing
13-17 December	Introduction to DSP Design
2000	
17-19 January	Introduction to Processing and Analysis of Vibration Data
24-26 January	Vibration Control
7-11 February	Measurement and Acquisition
6-10 March	Adaptive Methods
3-7 April	Active Control of Sound and Vibration
15-19 May	DSP Algorithms and Programming

SAVOIR (*Sound and Vibration: Organisation, Information and Resources*) - Copenhagen

3-7 April International Course on Noise and Vibration from Rail Transport Systems

Conference - 24-27 July, 2000

7th International Conference on Recent Advances in Structural Dynamics

Other courses planned include:

Noise measurement and assessment for EHOs
 Basic techniques for noise and vibration measurement and control
 Low Noise Design
 Applications of Statistical Energy Analysis
 Modal Analysis and Finite Element Model Validation

Further information regarding the above courses may be obtained from Mrs. Maureen Strickland
 Institute of Sound and Vibration Research,
 The University, SOUTHAMPTON, SO17 1BJ
 Tel: +44 (0) 1703 592294 Fax: +44 (0) 1703 593190
 e-mail: mzs@isvr.soton.ac.uk

August 3, 1999

Engineering Division Manager in 1994, retired in September. Among his duties, Dennis acted as the IOA Liaison Officer with the Engineering Council and other professional engineering institutions and, through his efforts, we have gained a reputation in engineering circles for being a friendly and effective institution, enhancing our standing with our peer organisations and with Engineering Council staff. We wish Dennis a long and active retirement. Professor Peter Wheeler stood down from Council at the 1998 AGM, and Professor Bob White, FEng, was elected in his place as Vice-President with responsibility for Engineering Division. Professor White has been involved in the work of the Engineering Division since its inauguration, serving on many of its professional interviews. As a former Director of ISVR, he has considerable experience of engineering education in acoustics, and was elected to the Royal Academy of Engineering in 1995. The Institute is scheduled for five-year review by the Engineering Council in 1999, following which, subject to satisfactory audit, extension of our scope of responsibilities will be pursued. As part of the review and revision of office systems at St Albans, new operating procedures are being developed for the Engineering Division and, following his retirement from Salford University, Peter Wheeler has taken over responsibility for the restructuring and management of Engineering Division support services, working part-time from the Institute's offices. The total numbers of CEng/IEng in Institute membership are now 361, of whom 124 gained their qualifications through the Institute. A further 110 are registered with the Engineering Council at stage 1, having gained the educational qualifications necessary for entry into the engineering profession.

Specialist Groups

The Institute reflects the broad spectrum of the science and application of acoustics. Several Groups have been formed to foster contacts between members of the various specialisms.

Building Acoustics Group

The Building Acoustics Group organised one meeting entitled *Building for a Sound Education*, held in September. This was a successful one-day meeting addressing the various aspects of acoustics in schools. Papers were given during the day on a wide range of issues, including the new DfEE Building Bulletins 86 & 87. The meeting was concluded with a discussion session. The Group is organising its next (biennial) auditorium acoustics meeting for Autumn 1999.

Electroacoustics Group

The Electroacoustics Group, having lain dormant for several years, was resurrected by a relaunch meeting held at the Reproduced Sound 13 Conference in October 1997. At the well attended meeting the Reproduced Sound Conference Committee was elected en bloc as the new Electroacoustics Group Committee, with Dr James Angus of the University of York as secretary and Ken Dibble of Ken Dibble Acoustics as chairman. The principal activity during 1998 was the organisation of the Reproduced Sound 14 Conference, which took place in October 1998 at the

Windermere Hydro Hotel, and setting in train plans for the future development of the Group. These included a full programme of papers to be presented during the Institute's 25th Anniversary Conference at the Barbican Centre in May 1999, a joint one-day conference on speech intelligibility to be arranged jointly between the Electroacoustics and Speech & Hearing Groups, and the annual Reproduced Sound Conference scheduled for November 1999.

Environmental Noise Group

The Environmental Noise Group maintained its momentum during 1998. A seminar/workshop on PPG24 was held in June, at Birmingham, which was oversubscribed. Useful feedback was obtained, which is being passed to the DETR. A seminar/workshop on the results of the trials of the draft Code of Practice on the Control of Noise from Pubs and Clubs was held at the University of the West of England in November, which was also oversubscribed. The meeting provided useful feedback to the working party, which is continuing to meet on a regular basis. Further trials will be undertaken during 1999. The Group continues to provide significant input to the joint IOA/IEA Guidelines on Noise Assessment, and slow but sure progress is being made on this document. The Group now also provides feedback between the Institute and the EU Noise Policy Working Groups, and we anticipate that the Institute's involvement in this process will increase.

Industrial Noise Group

There were no formal meetings organised by the Group during 1998. A new committee has now been formed,

and the Group will contribute to the 25th Anniversary Conference in May 1999. Other meetings are planned, including a one-day meeting in the Autumn of 1999 to mark the 10th anniversary of the Noise at Work Regulations, and it is hoped to arrange joint activities with other Specialist Groups.

Measurement & Instrumentation Group

The Measurement & Instrumentation Group planned 3 events during 1998. The first was an update to the very successful meeting held in 1997 on the Noise Action Levels. Metropolitan University was the venue for March, but despite help from the Yorkshire & Humberside Branch, only 16 delegates registered, and the event was cancelled. *Good Practice in Acoustical Measurements* was held at South Bank University in London on 9 June which attracted 47 delegates. Workshop style presentations covered 6 different topics, and all sessions seemed to give useful and practical information to the participants. A further meeting along similar lines entitled *Practical Aspects of Measurement Protocols* was arranged for December 8 at the NPL. Unfortunately, only 5 people registered for the meeting, and it was subsequently cancelled. The meetings for 1999 were planned during the year, the signs are that these will attract many delegates.

Musical Acoustics Group

The Musical Acoustics Group's principal activity in 1998 was a visit to Loughborough on 16 June. We went to Loughborough University in the morning where Dr John Tyrer talked about his work with laser interferometry, and its potential applications to musical instruments. In the

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Like to know more?

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afternoon we went to Taylor's Bell Foundry where the Curator, Mr Robert Bracegirdle, talked about the history of bell founding at Loughborough and demonstrated making, tuning and repairing church bells. Looking ahead, we began planning for a meeting to be held at Edinburgh University in July 1999, organised in association with the Galpin Society. The aim of the meeting will be to bring together researchers in musical acoustics with those in industry that might benefit from this research. Such meetings are actively encouraged by the Engineering and Physical Sciences Research Council (EPSRC) and we have submitted an application to them for financial support.

Physical Acoustics Group (Joint with Institute of Physics)

The current Group membership stands around 200, most of them being members of the Institute of Physics. The Committee currently has 10 members. The traditional Group Annual Review meeting took place on 23 September 1998 in the Institute of Physics premises in London. The Committee noted that the meeting was a success. Although the attendance was modest (23 people registered, including the speakers) those who attended found the meeting extremely useful. The Group's 1999 Annual Review meeting is planned again for the Institute of Physics, London. The Group Newsletter continued to be distributed among Group members. The information placed in the Newsletter includes a section on calls for proposals and deadlines for funding applications for various Research Councils and other funding bodies, a list of e-mail addresses for all Group members who had provided theirs on last year's questionnaire, and a section encouraging members to suggest ideas for specialist meetings. The committee met four times during 1998. All these meetings took place at the University College, London.

Speech Group

1998 was a more successful year for the Speech Group. In January, we held a large one-day meeting at British Telecom Laboratories near Ipswich. This was attended by over a hundred delegates and was intended to update attendees on the current state of speech research in the UK and to facilitate collaboration. The AGM was held after this meeting; three new committee members were elected and Dr Michael Brooke stood down as chairman. We would like to thank Michael for the work he has put in on behalf of the Group during many years on the committee. The Group held another one-day meeting in September at Lancaster University in conjunction with the British Association of Academic Phoneticians. The Autumn Speech and Hearing Conference was held as usual at the Hydro Hotel, Windermere. Although attendance was slightly down on 1996, the quality of the papers was high and the young researchers competition attracted some excellent entries.

Underwater Acoustics Group

Two major conferences were organised by the Group in 1998. In July, a topic that had been neglected for some time was given an airing at a meeting on *Underwater Acoustic Calibration and Measurements* at the National Physical Laboratory, Teddington, organised by Victor

Humphrey of Bath University and Stephen Robinson from NPL. This attracted 53 delegates, several from overseas, and 25 papers were presented. A well established topic, *Sonar Signal Processing*, originated by Prof Roy Griffiths at Loughborough University, was in danger of fading with the passing of Prof Griffiths. Fortunately, it reappeared at Weymouth in December at a conference organised by Prof Hugh Griffiths of University College London, ably assisted by Gary Heald and Sean Chapman from DERA Bingley. The Group continues to thrive, and future plans include contributing to the Institute's 25th Anniversary Conference as well as a number of important specialist meetings.

Group	1997	1998
Building Acoustics	535	512
Electroacoustics	126	117
Environmental Noise	716	685
Industrial Noise	453	433
Measurement & Instrumentation	105	102
Musical Acoustics	99	94
Physical Acoustics	75	72
Speech	101	97
Underwater Acoustics	150	142

Table 4. Group Membership

Regional Branches

The Regional Branches of the Institute of Acoustics have been established to further the technical and social activities of the Institute at local level.

Eastern Branch

This has been the tenth year of successful operation of the Branch. The organising committee met on five occasions and made detailed arrangements for eight meetings/events across the region. These were *Sound Insulation in Buildings* held at Braintree in February, *Clay Target Shooting Noise* held in Ipswich in March, the annual Branch dinner held at Essex University in April, *Planning and Noise* held in Bury St. Edmunds in May, a visit to Sizewell Power Station in June, *Entertainment Noise Control* held in Cambridge in September, *Vibration Isolation of Buildings* held in Colchester in October and *Acoustic Materials* held in conjunction with the AGM at Salex, Colchester in November. All these events were well supported, attendances varying from about 20 to 50, the higher figure relating to a half-day meeting. At the AGM, the new three year rule for committee membership was activated and three new members joined the committee. John Hustwick was elected chairman and Michael Alston was elected as secretary.

Irish Branch

The first AGM of the Branch was held on 24 September with almost 40 members and guests in attendance. Rupert Thornley-Taylor, the guest speaker, spoke eloquently on *The Development of Planning Guidelines for Environmental Noise Control*. The Institute's President, Ian Campbell, was present and conducted the elections, during which the officers returned were Gerry McCullagh (chairman), Oliver Hetherington (secretary), and Kevin Cham-

bers (treasurer). The AGM in Belfast was followed, on 9 November, by an evening meeting in Dublin, at the Institution of Engineers in Ireland. More than 40 members and guests from all over Ireland heard papers by Frank Clinton of the Environmental Protection Agency on *Irish Environmental Noise Legislation*, Gary Duffy of National Environmental Sciences (NES) and Brüel & Kjær on *Modern Environmental Noise Prediction Techniques* and Chris Dilworth also of NES on *Assessment of Noise for Complaints Purposes*. Over the year the committee held 5 meetings and discussed such topics as the Branch constitution, finance, membership and an all-Ireland meetings programme.

London Branch

It has been another buoyant year for the London Branch with a full programme of evening meetings, visits and a one-day conference. In total, ten events were held throughout the year. These comprised six evening meetings held at Symonds offices in Holborn, a meeting held at NEScot, a half-day visit to the Globe Theatre, a one-day conference at Church House in Westminster and our annual dinner also held at the Globe Theatre. Attendance at the meetings and functions has generally been good, averaging 30 members per event, although this has ranged from around 10 to 40 members. It never ceases to amaze the committee members that there isn't an even greater attendance given the large number of Institute members working and living in and around the London area. Members are urged to attend our varied programme for 1999 and to provide any suggestions for encouraging people to our forthcoming events. The half-day visit was held at the Globe Theatre which proved to be a very interesting and informative afternoon. This was not our last visit to the Globe as our annual dinner in November was also held at the Theatre in a very pleasant room overlooking the Thames and St Pauls. Our after dinner speaker, Professor Frank Fahy, provided an exceptional talk on the life and times of a professor which was not all plain sailing. The one-day conference on the topic of construction noise and vibration was a further successful event which was well attended. The conference provided the forum for numerous debates, not least that of the measurement of Vibration Dose Value, an aspect raised at other conferences throughout the year.

Midlands Branch

The Midlands Branch had a successful year with good attendances at its four evening meetings and its afternoon visit. The March evening meeting at the Covent Hospital, Sherwood, Nottingham was *Hearing Tests in the Workplace* by Rosie Hayes of 'Hear and There'; P C Werth sponsored the buffet. The June evening meeting at Donington Park Motor Racing Circuit was *Drive-by Monitoring of Motorsports* by Dr Mike Fillery of the University of Derby; the buffet was provided by Cirrus Research. The September evening meeting at Birmingham University was *Enabling with Music* by Gordon Dalgarno from Keele University. The September afternoon visit was to Motor Industries Research Association, MIRA, at Hinckley. The November Branch AGM and meeting were held at the Old Council House, Coventry with a presentation

on *Statistical Noise Indicators* by Ian Campbell, President of the Institute; the buffet was provided by Larson Davis.

North West Branch

Cliff Inman started off another successful year describing *Recent Advances in Glazing Technology*. In February we visited Greater Manchester Police's new Firearms Training Centre where Phil Ramsden of Manchester City Council discussed the noise control issues and Peter Sacre of SRL described how they were resolved. John Hinton described the current noise mapping situation in March. In April we visited Manchester Airport for an air side tour, and Knowsley Hall provided the concert venue for the social in August. At our September AGM, Duncan Templeton and Judith Ruttle of BDP presented acoustic designs of various music facilities in two educational buildings. In October, Peter Philipson described the progress in *Spatial Audio* at Salford University. Paul Michel brought together Bill Tempest, Mel Kenyon, Paul Freeborn, and John Houldsworth for a successful Noise Control Workshop in November. In December Dr Graham Day, a Consultant Audiologist, gave an interesting presentation on *Tinnitus and its Management*.

Scottish Branch

An afternoon meeting was held late last year on Statistical Energy Analysis. The meeting was reasonably well attended and Bob Craik presented a very interesting and humorous account of the subject. At our AGM John Nicol resigned due to pressure of work and Bill Frame of Salex Group Ltd succumbed to some arm twisting and is now Secretary.

Southern Branch

The 1998 AGM was held at Basingstoke and Deane Borough Council Civic Offices on 19 March 1998, when Ian Flindell was re-elected chairman and Dawn Connor was re-elected secretary for the subsequent year. There were a number of changes to the committee. Meetings included *Guidance on the Management and Control of Noise from Clay Target Shooting* organised by Dawn Connor at Basingstoke in March with speakers John Seller (BRE) and David Horrocks (Assured Environmental Health); *EC Noise Criteria* organised by Sue Blazdell and Sara Gandy at Winchester in July 1998 with speaker Ian Flindell (ISVR); *Noise Mapping and Noise Prediction* organised by Graham Parry at Basingstoke in September with speakers John Hinton (Birmingham City Council) and Ken Brown (Brüel & Kjær).

South West Branch

The AGM was held in March at the University of the West of England. The existing Branch officers were re-elected, with the addition of Tim Clarke and Graham Rock to the committee. Following this, the evening concentrated on Sound Transmission in Buildings with presentations from Joe Fanous *Short Method of Measurement*, Ken Brown *Instrumentation for Building Acoustics*, John Freegard *Intensity Measurements of Airborne Sound Insulation* and Graham Rock *Problems with Impact Sound Transmission Tests*. The evening was rounded off with a presentation to the former Branch chairman Norman Pittams who retired during the last year. In November the Branch held a very successful joint workshop with the Environmental Noise

Group focusing on the Draft Code of Practice on Noise from Pubs and Clubs, which was attended by over 60 delegates. The programme for 1999 will start with a joint meeting with the Western Branch of CIBSE.

Yorkshire and Humberside Branch

This has been the third year since the Branch reformed, in which period we have achieved our meetings target. Two meetings were held in 1998. In January at Leeds, Prof Frank Fahy gave an informative session on *Sound Intensity*, during which he proved that the borrowed sound intensity kit was not working and also gave many useful tips on the application of sound intensity, the gist of which was if you cup your ears and listen you will be just as successful. In November, also at Leeds, the AGM was preceded by a presentation by David Marsh on *Instrument Calibration*. At the end of the second year of CPD, four members of our Branch have submitted summaries, which is down from 13 last year. At the AGM, John Bickerdike stood down as secretary after many years of service, many thanks to him for his efforts.

Branch	1997	1998
Eastern	218	243
Irish	-	79
London	480	518
Midlands	286	307
North West	253	266
Scottish	108	120
South West	182	202
Southern	358	393
Yorks/Humberside	135	150

Table 5. Branch Membership

COUNCIL

Officers

President: Mr I J Campbell MIOA
 President Elect: Prof M A A Tatham FIOA
 Immediate Past President: Mr B F Berry FIOA
 Honorary Secretary: Dr A J Jones FIOA
 Honorary Treasurer: Mr K A Broughton MIOA
 Vice President (Groups & Branches): Mr D G Bull FIOA
 Vice President (Engineering Division): Prof R G White FIOA

Ordinary Members

Mr A N Burd FIOA
 Prof R J M Craik FIOA
 Dr P F Dobbins FIOA
 Mr C E English FIOA
 Prof B M Gibbs FIOA
 Mr C J Grimwood MIOA
 Prof P A Nelson FIOA
 Dr B M Shield FIOA
 Mr S W Turner FIOA

Chairmen of Standing Committees and Sub-committees

EDUCATION: Dr R J Peters FIOA
Diploma in Acoustics and Noise Control, Board of Examiners: Prof K Attenborough FIOA
Certificate of Competence in Environmental Noise Measurement Advisory Board: Dr M E Fillery MIOA
Certificate of Competence in Workplace Noise

Assessment Advisory Board: Mr A E Watson MIOA
Certificate of Competence in Measurement of Sound Transmission in Buildings Advisory Board: Prof R J M Craik MIOA

Continuing Professional Development Sub-Committee: Ms S M Bird MIOA

ENGINEERING DIVISION: Prof R G White FIOA

MEDALS & AWARDS: Mr I J Campbell MIOA

MEETINGS: Mr S W Turner FIOA

MEMBERSHIP: Mr J R Dunn MIOA

PUBLICATIONS: Dr P F Dobbins FIOA

Specialist Groups

BUILDING ACOUSTICS: Chairman Prof R J M Craik FIOA, Secretary Mr S D Chiles AMIOA

ELECTROACOUSTICS: Chairman Mr K Dibble FIOA, Secretary Dr J A Angus FIOA

ENVIRONMENTAL NOISE: Chairman Mr K M Collins MIOA, Secretary Mrs D G Connor MIOA

INDUSTRIAL NOISE: Chairman Dr R J Peters FIOA, Secretary Mr D G Bull FIOA

MEASUREMENT & INSTRUMENTATION: Chairman Mr R G Tyler FIOA, Secretary Mr P Hanes MIOA

MUSICAL ACOUSTICS: Chairman Dr P F Dobbins FIOA

PHYSICAL ACOUSTICS (Joint with the Institute of Physics): Chairman Dr D Cartwright, Secretary Dr N Saffari

SPEECH: Chairman Dr S J Cox MIOA, Secretary Dr A P Breen MIOA

UNDERWATER ACOUSTICS: Chairman Dr P F Dobbins FIOA, Secretary Dr P D Thorne FIOA

Regional Branches

EASTERN: Chairman Mr J M Hustwick MIOA, Secretary Mr M P Alston MIOA

IRISH: Chairman Dr G C McCullagh MIOA Secretary Mr J O Hetherington MIOA

LONDON: Chairman Mr J E T Griffiths MIOA, Secretary Mr A J Garton MIOA

MIDLANDS: Chairman Mr J F Hinton MIOA, Secretary Dr M E Fillery MIOA

NORTH WEST: Chairman Mr P E Sacre MIOA, Secretary Mr P G Michel MIOA

SCOTTISH: Chairman Dr B McKell MIOA, Secretary Mr W C Frame MIOA

SOUTHERN: Chairman Dr I H Flindell MIOA, Secretary Mrs D G Connor MIOA

SOUTH WEST: Chairman (Acting) Mr S Simpson MIOA

YORKSHIRE & HUMBERSIDE: Chairman Mr R F Scott MIOA, Secretary Mr T M South MIOA

Table 6. Institute Personnel at 31 December 1998

Institute Buyers' Guide Millennium Issue

Forms for submitting entries are now available.
Keith Rose Fax: 01223 264827

STANDING COMMITTEES OF THE INSTITUTE

The Publications Committee

It has become apparent that many IOA members are not aware of the purpose of, or indeed the existence of, the various committees which control the activities of the Institute. In order to remedy this situation, and hopefully to involve members more fully in the activities and future development of the Institute of Acoustics, a series of articles has been planned which will explain the constitution, purposes and achievements of the several standing committees of the Institute.

This article deals with the Publications Committee, chosen first not because it is more important than the others, which it is not, but because one of its responsibilities is the production of the Institute Journal, the Acoustics Bulletin, which you are now reading, and it seemed appropriate to start with the committee which controls the way in which the Institute is presented to the world through its publicity material.

The work of the other standing committees, Membership, Meetings, Education, Professional Development and Medals and Awards will be described in future issues of the Acoustics Bulletin.

The Publications Committee consists of up to four corporate members, from whose numbers the Chairman and

Secretary are appointed, and ex officio members who include the President, Chief Executive, Honorary Secretary, Advertising Manager, Acoustics Bulletin Editorial Subcontractor and Librarian.

The committee acts as the supervisory body for all Institute publications that are of a substantially permanent nature. The publications include the Acoustics Bulletin, IOA Members Register, Conference Proceedings, Medal Lectures, Annual Report, Buyers' Guide, diploma material, education and careers information and meeting notices. The Committee is not itself responsible for generating publicity material, although it can contribute to this, but rather for ensuring that all the material generated by the various arms of the Institute emerges in a recognisably consistent style. The operation and development of the library are also within the remit of the committee.

The Acoustics Bulletin Board of Management is a sub-committee of the Publications Committee and meets following the publication of each issue of the Bulletin. Its role is to propose, monitor and review the editorial and advertising policy of the Bulletin in liaison with the editorial subcontractor, and to monitor and control the contracts that cover the editorial and printing of the Bulletin. When appropriate the Board also comments on issues of the Members Register and Buyers' Guide.

The European Acoustics Association (EAA) has, on two occasions in recent years, produced an EAA Members Register. The IOA, through the Publications Committee, will be responsible for producing the next issue.

The main function of Acoustics Bulletin is to provide news to members and perform a CPD role by keeping all members up to date with developments over the complete spectrum of acoustics. Technical articles of general interest are included in each issue, but the primary function is not as a vehicle for the publication of new work. The published IOA Proceedings and Acta-Acustica – the Journal of the EAA – are more appropriate media for authors wishing to have their work refereed.

The editorial team strive to ensure that the Acoustics Bulletin is published according to a strict two-monthly schedule, but a combination of late copy and printing delays has been responsible for some fluctuation in recent months. The committee is taking steps to rectify the situation.

It is appropriate at this point to express the gratitude of the Committee and Board to Cathy Mackenzie Management Services, the editorial subcontractor, and to Keith Rose, Advertising Manager, for their invaluable work on behalf of the Institute, which results in the publication you are now reading. Due to their efforts the Acoustics Bulletin has attained a professional standard and is now a self financing publication. The Committee and Management Board wish to see this improvement

With Regret

It is with deep regret that the Institute announces the very recent deaths of the following members.

Professor Douglas Robinson HonFIOA

Dr John Knight OBE FIOA

Dr John Holmes HonFIOA

They had all played an important part in the establishment and development of the Institute and the profession of acoustics.

The Council of the Institute extends its condolences to their families.

Obituaries will appear in a later issue.

continue and would be glad to hear from members having any ideas and suggestions directed to that end.

The second issue of the Buyers' Guide is currently under production. The number of product/services categories is to be increased and information on companies expanded by the introduction of a one-hundred word summary, as an option for each contributor. In order to maximise sales revenue from the Guide and to raise the profile of the Institute, we are aiming to expand the circulation of the Guide beyond the confines of the Institute Membership and are actively investigating the possibility of placing the Guide on the Institute Website.

The Website itself is on the Publications Committee agenda. It has generated much interest, with visitors from as far afield as Texas, Germany and Canada. It has recently been developed to feature a 'situations vacant' page which has stimulated a favourable reaction from advertisers.

Many members will by now have noticed a change in the style of Proceedings. These changes are the fruits of a Working Party of the Publications Standing Committee, chaired by John Tyler and including Ian Campbell (now our current President) and Richard Tyler, chairman of the Measurement and Instrumentation Group, (we've checked back to stone-age man but the Tylers don't appear to be related!) and Roy Bratby, Chief Executive. The Working Party recorded its appreciation to Roy Lawrence, on his retirement in 1997 from the post of Proceedings Editor, for the considerable time and energy he devoted to the Proceedings over many years. The Working Party's objectives were to improve the standard of papers presented at meetings and conferences and to improve the appearance of the printed page in the Proceedings volumes. Proceedings are now produced in A4 format which improves the clarity of figures and tables. The Working Party has also prepared a Guide for Conference Organisers, Guidelines for the Presentation of Papers and Guidelines for Presenting Workshops, to help in the drive to achieve improved and consistent standards.

The Publications Committee also has responsibility for the Institute library. Alison Hill, the Institute Librarian, published an article in the March/April issue of Acoustics Bulletin which summarised the facilities and services currently available. The Committee would like further to develop the library facilities for the greater benefit of members and to this end would welcome your views as to ways in which you would like to see the library progress. If you have any comments on this or any other aspects of the work of the Publications Committee, please write, phone or e-mail us at the Institute Office.

John Miller MIOA, Chairman Publications Committee.

Membership Committee

MIOA/AMIOA

The membership grade of Associate Member (AMIOA) was instituted to serve as an introductory grade prior to full corporate membership. Thus, persons having an educational qualification acceptable for MIOA – most often our own Diploma – but not yet having the necessary experience are encouraged to join the Institute in this non-corporate grade. Equally, those having a related but lower qualification and limited acoustic experience can occupy this grade until they achieve an adequate period of experience and further training. The Membership Committee considers that after a period of up to five years in a responsible position sufficient practical experience should have been attained and it is expected that the member should then be in a position to make a successful application for the grade of MIOA. It is also expected that this experience will include further training under the CPD scheme (this may be by attendance at conferences etc, not necessarily by formal academic courses).

In order to encourage this transition it is proposed that, with effect from January 2000, the subscription for members who have been five years in the grade of AMIOA will be increased to be the same as for MIOA. Any members who feel that they will be adversely affected by this proposed change are invited to write to the Chairman of the Membership Committee prior to its next meeting on 30th September 1999 outlining the reasons for their concern. Any other comments would also be welcomed.

Branch News

Scottish Branch

Annual General Meeting

The AGM was held on 23 June after which the IOA President Ian Campbell presented a discussion paper on Statistical Parameters and European Policy. The meeting was very well attended (22 members) and Ian's paper provoked some lively discussion on the use and abuse of statistical parameters. The mention of emerging European thoughts on environmental noise inevitably led to further discussion on the use of noise mapping and at that point there was healthy disagreement with some members viewing such a practice as useless and others valuing the role of mapping in a more strategic and decision making role.

The meetings schedule for the coming year was discussed and it is hoped that the Scottish Branch will host a meeting on concert hall acoustics with the main emphasis

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of the meeting being the Glasgow Concert Hall. Later in the year an Open Forum on Inaudibility is planned. The Chairperson suggested holding the meeting as a debate with speakers for/against, candidates for this event have been suggested and will be written to shortly (all members present supported this format). This is to be followed by a meeting on the success or otherwise of the new PAN 56 (Scottish version of PPG 24).

It was also agreed that members' e-mail addresses will be circulated (this is in hand) and it is hoped that all members will let the Chairperson and committee members have their views on what they want to see and hear happening within the Scottish Branch.

The meeting was continued (very informally!) in a nearby watering hole where much discussion took place on the forthcoming events!

Bernadette McKell MIOA

Irish Branch

First AGM of the Irish Branch

This was held in the Belfast Institute of Further and Higher Education on 24 September 1998. It was encouraging to have an attendance of almost 40 at the meeting, encouraged along no doubt by the fact that Rupert Taylor had agreed to present a paper entitled *Planning and Noise – Recent Developments on Noise Policy within the EU*. The members of the Branch were also glad that the Institute President, Ian Campbell was able to make a flying visit to bring the latest news on the activities of the Institute and to conduct the AGM. Mr Taylor's presentation was greatly appreciated and a lively discussion ensued. Following the discussion, the AGM was conducted in record time, with the election of Dr Gerry McCullagh as Branch Chairman and the other members of the Steering Group elected to the Branch Committee.

The first Institute meeting in the Republic of Ireland was held on 9 November at the headquarters, Institute of Engineers in Ireland. This was somewhat of an unknown quantity beforehand since the membership in Southern Ireland is still relatively small. It was, therefore, very pleasing to have an attendance of 42 from public and private organisations and education, to hear presentations from Frank Clinton, Environmental Protection Agency, Gary Duffy and Chris Dilworth of NES Acoustics, on *Prediction, Assessment and Control of Environmental Noise*. A series of meetings is planned in a number of centres in Ireland as part of our aim of increasing the membership of the Institute in Ireland and of raising awareness of acoustics.

Oliver Hetherington MIOA

Eastern Branch

Evening Meeting

On the 21st April an evening meeting was enjoyed by a varied professional audience at Braintree Town Hall when John Seller delivered a lecture on the The Spectrum Adaption Terms of BS EN 717 Parts 1&2 and BRE Approved Document E. The complex content of this lecture was well covered with reference to types of noise source, frequency range, microphone positions, noise

source positions, the Spectrum Adaption Terms and the effect these have on the resultant single figure ratings.

M P Alston MIOA

Summer Social: River Orwell Trip on a Thames Barge

This year, we thought we would try something a little less formal than the sit-down dinner with speaker for our social bash. The dinner has been falling in popularity in recent years, and generally fails to attract the younger members.

The barge trip went ahead on 12 June, with a near-full complement of 48 people. The plan was for a warm summer evening sail on the beautiful River Orwell. In the event, it rained all evening – the 'wettest June day in 10 years'. The captain and crew were amused by the number of stalwarts who insisted on regular forays on deck, in spite of the weather. Normally, only the birdwatching fraternity are so dismissive of rain. It was explained what we all did for a living, and that long hours spent listening to the rain falling were part of our normal activities!

Those who did venture out were granted grey and misty views of the Orwell Bridge, and various aspects of the Orwell Estuary as far as Felixstowe, with sight of Harwich and Shotley. Notwithstanding the foul weather, the event went very well – the cabin was warm and dry, the food great, the bar well-stocked and the company good. Tentative enquiries about a repeat next year were well-received – we'll be back!

Thanks to all those who supported the event, to the IOA who handled the money side for us, and to Topsail Charters for arranging everything.

Catherine Day AMIOA ❖



ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

The Swiss Federal Institute of Technology Lausanne (EPFL) invites applications for a position of

Maître d'enseignement et de recherche (MER) in Acoustics

for the Department of Electrical Engineering

The task of the successful candidate will be to develop teaching and research activities in acoustics, more specifically for the modeling of acoustic fields (radiation and propagation). He/she will develop innovative research related to active noise control. This activity will take place within the existing Laboratory of Electromagnetism and Acoustics, in collaboration with other institutes of EPFL, as well as with other institutions and industries on national and international levels.

Aptitudes for teaching and project management, scientific excellence, personality and industrial background are major assets. He/she will supervise student projects, diploma and doctoral theses.

Deadline for registration: October 15, 1999. Starting date: upon mutual agreement. The EPFL strongly invites women to apply. Please ask for the application form by writing or faxing to: **Présidence de l'École polytechnique fédérale de Lausanne, CE-Ecublens, CH-1015 Lausanne, Suisse, fax nr. +41 21 693 70 84.** For further information, please consult also URL: <http://www.epfl.ch>, <http://dewwww.epfl.ch/>, <http://admwww.epfl.ch/pres/profs.html> or <http://research.epfl.ch/>

Hansard

23 April 1999

Noise (Trunk Roads)

Mr Edwards: To ask the Secretary of State for Wales (1) what assessment he has made of the problems of noise to residents from the A449 trunk-road near Llanishen in Monmouthshire; (2) when he proposes to publish revised criteria for noise mitigation measures on existing trunk roads.

Mr Hain: No noise assessment has been undertaken in Llanishen, Monmouthshire. A preliminary analysis of the noise levels from the A449 at Llandenny, immediately adjacent to the road, indicated that it would not meet the noise mitigation criteria announced recently for England. I announced on 23 March 1999, Official Report, columns 126-27, that we would be extending this analysis of noise levels adjacent to the trunk road network in Wales and considering the scope for adapting the criteria to meet specific Welsh circumstances. This review will take some six to nine months to complete.

Following the transfer of functions, this issue will be a matter for the National Assembly.

7 May 1999

Aeroplane Noise Regulations 1999

Baroness Farrington of Ribbleton rose to move. That the draft regulations laid before the House on 14th April be approved [15th Report from the Joint Committee].

The noble Baroness said: My Lords, I beg to move that the Aeroplane Noise Regulations 1999 be approved.

The need to implement the latest European directive on aeroplane noise has provided the impetus to brigade in a single measure the noise certification requirements of four other European Council directives which are currently implemented in three separate statutory instruments.

Noise certification is complex because of the numerous categories of aeroplanes which must be included and the number of different standards which apply. However, for all their apparent complexity the regulations are principally an exercise in consolidation. There is little in them which is new and nothing which places additional burdens on either the aviation community or the regulatory authorities.

While these regulations involve no direct increases in noise stringency, they do consolidate and unify in a single measure the standards covering the vast majority of aeroplanes currently flying in the UK. I commend these regulations to the House.

Moved. That the draft regulations laid before the House on 14th April be approved [15th Report from the Joint Committee.] – (Baroness Farrington of Ribbleton)

Baroness Thomas of Walliswood: My Lords, air noise certification is where I entered politics. I long remember a dinner party in Kew, sometime in the 1960s, attended by two people from the Ministry who told us cat-

egorically that it would be impossible to reduce the noise made by jet engines because their power would be reduced and the aeroplanes would fall out of the sky. All I can say is that I have used that example over many years to illustrate the power of demand for quietness, or any other product of engineering, as a way of making engineers concentrate their attention on something which is required by the general public.

I am delighted to welcome this consolidation of the existing regulations. It will obviously make life easier. We will not have to peer into all sorts of different tomes. But one minor point puzzled me. Regulation 14 gets rid of the preceding four paragraphs. Does that mean that the various derogations contained in those four paragraphs will disappear on 1st April 2002?

Secondly, can the Minister reassure us that Regulation 24, which allows the CAA to permit exemption from Chapter 3 noise standards in the run-up to April 2002 for the purposes of fleet management is not a back-door route to any softening of attitudes to compliance?

Finally, I am sure the Minister will be able to reassure us that pressure for a continuing decrease in noise emissions from aircraft will be maintained.

Viscount Simons: My Lords, these regulations covering aircraft noise are to be welcomed. While it is unconnected with these regulations, I wish to plant an idea among those who have an appropriate interest. The technology concerning aircraft emission falls some 40 years or so behind vehicular emissions. Is it not time to address the problem of aircraft emissions?

Lord Brabazon of Tara: My Lords, we on these Benches have no objection to these regulations. As the Minister said, they are essentially a consolidation of existing regulations and, as far as I am aware, they do not introduce anything new. I am also pleased that, as far as I can see, they do not impinge on any of the difficult current issues, such as hush kits, Concorde flights to the United States and fully-laden Boeing 747-400s.

However, I am slightly concerned about Regulation 13, which gives a list of so-called developing nations whose aeroplanes are exempted. First, I am surprised that Saudi Arabia is considered to be a developing nation. I thought it was one of the richest countries in the world. Also, I am surprised to see both Libya and Iraq included in the list. It is unlikely that any of their aircraft will come to this country. I understood that if they did, they were likely to be shot down.

Apart from that, I give the regulations full support.

Lord Berkeley: My Lords, in relation to the comments of my noble friend Lord Simon, we have heard a great deal about greenhouse gases over the past year or two following the Kyoto Summit. My noble friend made the point, quite rightly, that there seems to be no improvement in the engineering design of exhaust emissions. As the noble Baroness, Lady Thomas, said, that is probably because there was no pressure upon the engineers to concentrate on that aspect. I firmly believe that if pressure is brought to bear, people will come up with solutions.

The Kyoto targets have to be met by the motor industry.

To some extent they are being met by the electricity generating people and it seems odd that airline industry is exempt from the restrictions, like so many other things. It is also exempt to some extent from the ownership restrictions of airlines about which we have heard before.

The other exemption which I find odd is the exemption from any fuel tax. The airline industry gets all its fuel duty-free. I suspect that if pressure was brought to bear on airlines to sort out some of these problems, one would find solutions coming very quickly.

Finally, I understand that some third world countries might need to have exemption from these regulations, but they are related to noise and they are safety regulated. Surely all aeroplanes that land in this country should have to comply with the same regulations.

Baroness Farrington of Ribbleton: My Lords, aeroplane noise standards are agreed within the International Civil Aviation Organisation and are set out in the chapters of Volume 1 of Annex 16 to the Chicago Convention of 1944 and implemented by contracting states in their own territory. Legislation to apply the ICAO noise standards in this country has existed since 1970, but the international nature of aviation means that measures to control noise are most effective when co-ordinated across national boundaries. We have therefore supported the growth of UN legislation to apply the standards agreed in ICAO.

The noble Baroness, Lady Thomas, raised the issue of derogations in paragraph 14. They will disappear because after 2002 aeroplanes will have to meet the highest current standards. I can assure the noble Baroness that there will be no softening of attitudes to compliance as it is closely monitored by the CAA.

The noble Lord, Lord Brabazon of Tara, raised the issue of Libya and Iraq. The developing nation schedule at the end of the regulations apparently includes exemptions for aeroplanes from Libya and Iraq. However, those exemptions are subject to any sanctions and embargoes which the UN may have imposed on specific states. That is explicitly stated in the notes to the schedule attached to Directive 92/14 EEC and applies to all EU member states. However, it was not copied out on the face of the regulations.

My noble friends Lord Simon and Lord Berkeley raised issues relating to pollution, and a question was also raised about fuel tax exemption. The exemption is internationally agreed through ICAO. We agree it should change, but by international agreement to avoid distortion.

The other question raised concerned air pollution. Aircraft contribute around 2 or 3 per cent of global man-made pollution. Over the past 20 years they have become twice as fuel efficient per passenger kilometre. The UK Government play a leading role in the environmental committee of the International Civil Aviation Organisation which is investigating the effects of aircraft pollution and looking for ways to make them cleaner. A special report on aviation and the global atmosphere has been prepared under the auspices of the Inter-

governmental Panel on Climate change and is expected to be published in June.

In terms of the UK, our White Paper policy indicates that in the near future we hope to consult widely on proposals for new legislation to help airports enforce noise mitigation measures or enable local authorities to enforce noise mitigation agreements. However, where airport operators have adequate noise measures in place, new legislation may not be relevant, Kyoto has charged the ICAO to work on the allocation of emissions from international aviation so that they can be included in the Kyoto process. I hope that I have answered all the points raised, and I commend the regulations to the House.

On Question, Motion agreed.

10 June 1999

Night Flights

Joan Ruddock: To ask the Secretary of State for the Environment, Transport and the Regions if he has reached conclusions following the second stage of the consultation on night restrictions at Heathrow, Gatwick and Stansted; and if he will make a statement.

Ms Glenda Jackson: On 17 November 1998 the Department of the Environment, Transport and the Regions issued the second of two consultation papers on the next night restrictions regime for Heathrow, Gatwick and Stansted airports, to apply from 31 October 1999 until the end of the 2004 summer season. This second consultative paper took into account all relevant responses to the preliminary consultation paper issued on 27 February 1998.

The November consultation paper was in two parts. Part 1 was concerned with all aspects of the night restrictions regime now applying at the three airports. Part 2 examined options for changes to the preferential use of Heathrow's runways at night. The decisions I am announcing today are concerned with Part 1 of the November consultation paper only. Consideration of the responses to the options examined in Part 2 is continuing and a separate announcement will be made on that in due course. Decisions on Parts 1 and 2 of the consultation paper are not inter-dependent.

The current night restrictions are among the most stringent in Europe: night movements by Chapter 3 noise-certificated aircraft are not limited at most other leading airports. We said in the preliminary consultation paper that we did not expect to propose major changes to the night restrictions for the next regime. To relax the restrictions significantly or to ban night flights entirely would not be consistent with the Government's objectives set out in the consultation paper.

We have decided to implement the proposals in the consultation paper, but with four modifications.

(a) The proposal to reduce the seasonal noise quotas for Heathrow from winter 1999-2000 onwards to nearer the level of current usage is to be implemented but with smaller reductions in the noise quotas than proposed. The winter season noise quota will be set at a level which is below quota usage in winter 1998-99.

(b) The proposal to reduce the seasonal noise quotas for Gatwick progressively from winter 2001-02 onwards is to

be implemented but with larger reductions in the noise quotas than proposed.

(c) The proposal to reapportion the Gatwick movement limits pro rata to the length of the summer and winter seasons is not to be implemented and the current apportionment of the movement's limits is to be retained for the next regime.

(d) The proposal to increase the noise quotas for Stansted, while maintaining the incentive for airlines to use quieter aircraft at night is to be implemented but the reasons underpinning it differ to some degree from those set out in the consultation paper.

The overall effect of the decisions is to put in place a new night restrictions regime at the three airports which will contribute towards achievement of the Government's objectives set out in the consultation paper. The decision to reduce the noise quotas for Heathrow to nearer the level of current usage, and in the case of the winter season to a level below usage in winter 1998-99, will help safeguard the improvement in the noise climate during the noise quota period brought about since 1993 under the current regime.

The decision to reduce the noise quotas for Gatwick by more than proposed in the consultation paper, in conjunction with the decisions we have reached on other aspects, is expected to bring about an improvement in the night noise climate around the airport over time. The decision not to reapportion the Gatwick movements limits pro rata to the length of the seasons will enable airlines to develop services in summer by more than would have been the case under the Government's proposal, but other environmental benefits will be provided through the larger than proposed reductions in the noise quotas. The decision to increase the noise quotas for Stansted by about 3.5 per cent per annum will provide for the further development of the airport broadly as envisaged in 1993 and 1994.

The full decision and the reasons for the decision are dealt with in the document *Night Restrictions at Heathrow, Gatwick and Stansted: Revised restrictions with effect from 31 October 1999*, copies of which have been placed in the House Library.

In reaching these decisions we have taken into account the disturbance caused by night flights and the need to ensure that local communities are not exposed to excessive levels of aircraft noise at night. Account has been taken of the existing noise climate around each airport, the local circumstances of each airport, and the distribution of population under their principal arrival and departure tracks. These have been weighed against the aviation interests involved, the existing air services using each airport and the wider economic considerations. We believe that the decisions announced today would protect local people from excessive levels of aircraft noise at night.

Copies of responses, except where the author has requested confidentiality, will be made available for inspection by prior appointment at the DETR Information Centre, Great Minster House, 76 Marsham Street, London, SW1P 4DR.

15 July 1999

Aeroplane Noise

Mr Woodward: To ask the Secretary of State for the Environment, Transport and the Regions how many meetings Ministers have had with (a) officials and (b) others regarding the draft Aeroplane Noise (Amendment) Regulations 1999.

Ms Glenda Jackson (holding answer 14 July 1999): None. The draft Aeroplane Noise (Amendment) Regulations are simply an administrative measure. They align UK legislation with the latest EU amendment by deleting eleven aeroplanes which no longer qualify for exemption.

16 July 1999

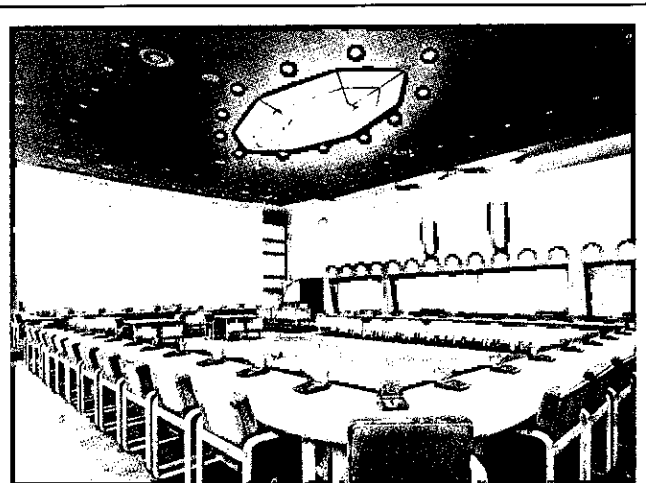
Aeroplane Noise (Amendment) Regulations 1999

Baroness Farrington of Ribbleson rose to move, That the draft regulations laid before the House on 29th June be approved [24th Report from the Joint Committee].

The noble Baroness said: My Lords, I beg to move. These regulations are made under the provisions of the European Communities Act 1972 and implement Commission Directive 1999/28/EC.

In accordance with these procedures introduced by Council Directive 98/20/EC of 30th March 1998, this is the first action to amend the schedule of exempted aeroplanes from the developing nations attached to the directive.

The Commission has removed 11 aeroplanes from the



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schedule because they no longer qualify for exemption. Some have been damaged beyond economic repair, while others have moved from the register on which the exemption was granted. The effect of the Aeroplane Noise (Amendment) Regulations is to align exemptions in the UK with Directive 98/20/EC by removing those 11 aeroplanes from the schedule attached to the Aeroplane Noise Regulations 1999.

From the point of view of noise at UK airports, this measure will be beneficial. It will reduce the number of older, noisier aeroplanes allowed to fly into the UK. There are no other effects. I commend the regulations to the House.

Moved, That the draft regulations laid before the House on 29th June be approved [24th Report from the Joint Committee]. – (Baroness Farrington of Ribbleton.)

Lord Brabazon of Tara: My Lords, I have looked at the regulations and can see no objection to them. Therefore, I give them my support.

Lord Newby: My Lords, we equally support the regulations.

On Question, Motion agreed to.

Extracts provided Rupert Taylor FIOA.

BSI News

BS EN Publications

BS EN ISO 13753:1999 Mechanical vibration and shock – Hand-arm vibration – Method for measuring the vibration transmissibility of resilient materials when loaded by the hand-arm system. No current standard is superseded.

BS EN 166101:1999 Harmonized system of quality assessment for electronic components – Blank detail specification: Surface Acoustic Wave (SAW) filters – Capability approval. No current standard is superseded.

British Standard Implementations

BS ISO 10534: Acoustics – Determination of sound absorption coefficient and impedance in impedance tubes.

BS ISO 10534-2:1998 Transfer-function method. No current standard is superseded.

Special Announcements

BS EN 60704: Test code for the determination of airborne acoustical noise emitted by household and similar electrical appliances.

BS EN 60704-1:1995 General requirements. This standard was withdrawn in July 1997. It is now being reinstated as not all sections of BS EN 60704-2 have been revised to align with BS EN 60704-1:1997.

British Standards Proposed for Confirmation

BS 6655:1986 Specification for pure tone air conduction

threshold audiometry for hearing conservation purposes.
BS EN ISO 9614-1:1995 Acoustics – Determination of sound power levels of noise sources using sound intensity – Measurement at discrete points.

Drafts for Public Comment

99/561983 DC ISO/DIS 14257 Acoustics – Measurement and modelling of spatial sound distribution curves in workrooms for evaluation of their acoustical performance.

99/707046 DC Draft BS EN 13477-1 Non-destructive testing – Acoustic emission – Equipment characterisation – Part 1: Equipment description.

99/707047 DC Draft BS EN 18477-2 Non-destructive testing – Acoustic emission – Equipment characterisation – Part 2: Verification of operating characteristics.

ISO Publications

ISO 6969:1999 Road vehicles – Sound signalling devices – Tests after mounting on vehicles. Will not be implemented as a British Standard because within EC, these devices are subject to legislation (70/338EEC and ECE Reg 28).

Other Documents Not Issued as DPCs

ISO/IEC 2382 Information technology – Vocabulary.

ISO/IEC 2382-29 Artificial intelligence – Speech recognition and synthesis.

ISO/IEC 2382-34 Artificial intelligence – Neural networks.

Final Draft International Standards have been received for both of these standards. They were produced by ISO/IEC JTC SC1 which was disbanded by ISO/IEC JTC1 in January 1999.

International responsibility for these standards was passed to ISO/IEC JTC1 upon the closure of its sub-committee. The United Kingdom was an 'O' member of ISO/IEC JTC1 SC1 as the United Kingdom did not have access to suitable expertise to respond on these topics. This situation still pertains with the new responsibilities for these standards.

Consequently, these drafts will not be published for Public Comment neither will they be implemented as British Standards should they be accepted at this ballot.

Any enquires should be addressed to the Secretary to IST/-/10 at BSI Head Office.

DIN Publications

DIN 45669: Measurement of vibration immission.

DIN 45669-1:1995 Vibration meters – Requirements and verification.

DIN 45669-2:1995 Measuring method.

ISO Standards

ISO 2953:1999 (Edition 3) Mechanical vibration – Balancing machines – Description and evaluation.

This information was announced in the May and June 1999 issues of BSI Update, copies of which are kept in the Institute library.

Book Reviews

THE PHYSICS OF MUSICAL INSTRUMENTS

2nd edition

Neville H Fletcher and Thomas D Rossing

Publisher: Springer-Verlag 1998

ISBN 0 387 98374 0 Price £53.00

In every field of science and engineering there is 'the' textbook. In musical acoustics, even though it has been around for less than ten years, that book is probably Fletcher and Rossing. It is not easy reading, and it is a little short on description and explanation to accompany the mathematics. It is, however, the most comprehensive assembly of information available about the essential physics of musical instruments, and there is probably a copy on the bookshelf of almost everybody with an interest in musical acoustics.

But now there is a new edition, so the question to be addressed by this review is not 'is there anything of interest in this book', but 'is there anything in the new edition that wasn't in the original'. In short, is this a worthwhile advance, or is it like rather a large number of software upgrades.

The first clue is that the new edition runs to 756 pages, some 20% larger than the original, and it has a whole new section devoted to materials for musical instruments.

The second clue is that most chapters have one or two items added. Some of these, such as the many additions on non linearity, relate to advances in theoretical acoustics. Some, such as the section on the use of synthetic materials in guitar construction, represent practical developments in instrument making. Some, however, such as the section on the violin sound post and bass bar, should perhaps have been there from the start.

The third clue is found simply by glancing through the contents (noting in passing that the contents list for the new edition fills nine whole pages). Although the cover notes claim that 'This second edition has been thoroughly revised...', there seems to be little noticeable change in most of the early chapters on vibrating systems, and this is confirmed by comparing the text in the two editions. In the later chapters dealing with specific classes of musical instruments, however, there have been more changes. Additions relating to non-linearity have already been mentioned, the chapters on guitars and lutes, bowed string instruments, and woodwind reed instruments, have many additions, while those on sound generation by reeds, flutes and flue organ pipes, and drums, have undergone significant reorganisation.

Finally, and perhaps most importantly, the references and bibliography have been enlarged and updated along with the text. This is still one of the best places to start looking for references to either the basics or the latest research on any aspect of musical acoustics.

Returning to the original question, and remembering that the price of a book like this represents several months pay at the new minimum wage rate, if you don't

have a copy of Fletcher and Rossing, then you should buy it now. If you do have a copy of the first edition that is getting dog-eared, or if your institution is paying, then go and get the new edition. If you are happy with your first edition, and you would have to pay for a new one out of your own pocket, you just need to check where the nearest library is where you can refer to a copy of the second edition.

Peter Dobbins FIOA

DIGITAL SPEECH

A M Kondoz

John Wiley & Sons Price £50.00

When I was asked to review Digital Speech I assumed it would be about speech synthesis but the subtitle 'Coding for Low Bit Rate Communications Systems' more accurately reflects the contents. Had it been about speech synthesis I could have related the story of Walter Lawrence who designed and built one of the first modern speech synthesisers in the 1950s. He shipped it to the US for a demonstration at an Acoustical Society of America meeting. In New York a customs official asked him what it was. He replied that it was a talking machine. The official clearly did not want to charge him duty but was not sure how to avoid it. Then he smiled and stuck a label on the synthesiser. It read 'Magician's equipment'!

This book contains no magic. It is concerned with the theory and practice of speech coding, an ever increasingly important topic in view of the popularity of mobile telephones. Standard PCM systems digitise speech at a sampling rate of 8 kHz with an 8-bit quantiser, transmitting the signal at 64 kbits/s. If speech could be reduced to a string of phonemes the 'meaning' could be transmitted at about 100 bits/s, so there is enormous scope for efficient coding.

The first four chapters introduce the fundamental techniques: sampling and quantisation (scalar and vector), spectral analysis, linear prediction analysis (LPC), pitch estimation, and alternatives to LPC such as line spectral frequencies. Two chapters are devoted to coding strategies: frequency and time domain coders, analysis by synthesis coding, multi-pulse LPC and code-excited linear prediction coding (CELP). Practical problems and their solutions are discussed. Complex algorithms take time to execute but listeners prefer a minimal (ideally zero) delay. Reducing the bit rate reduces the speech quality, but what will listeners tolerate? Transmission channel noise introduces errors, but how can these be controlled? Other system application aspects such as echo cancellation, errors introduced by discontinuous transmission (only transmit when speech is present to save bandwidth and battery life), and data security are also discussed. Finally real-time implementation is described. There are two appendices containing CELP subroutines in 'C' and DSP32C assembler.

The book is well produced and comprehensive, containing a plethora of diagrams and useful references. It was first published in 1995 and has been reprinted nearly every year since. Why, then, is the price so high?

W A Ainsworth FIOA ❖

New Products

CIRRUS RESEARCH

Sound Level Meter CR: 800A

The CR:800A is the first in a new generation of instruments from Cirrus, and provides all of the functions and features demanded from a modern sound level meter.

The menu operation and keypad provide a simple user interface, making the instrument easy to use, an essential requirement for today's busy safety professional as well as those involved in environmental noise monitoring and control.

A wide range of options and accessories are available which allow the range of measurements to be enhanced. These include $1/1$ and $1/3$ Octave Band Filters, a Type 1 option, as well as complete measurement kits.

All versions of the CR:800A are supplied with the Deaf Defier for Windows™ software which allows measurements to be down-loaded to a PC. This program also includes a facility to calculate the effective protection provided by a range of hearing defenders and protectors.

For further information, contact James Tingay, Sales & Marketing Manager, Cirrus Research plc, Acoustic House, Bridlington Road, Hunmanby, North Yorkshire YO14 0PH Tel: 01723 891655 Fax: 01723 891742.

Cirrus Research is a Key Sponsor of the Institute.

LMS INTERNATIONAL

SYSNOISE Rev 5.4

LMS has announced the release of SYSNOISE Rev 5.4, the LMS flagship product for computational vibro-acoustics. SYSNOISE predicts the acoustic field generated inside and outside a vibrating structure – or the vibration response caused by noise. The most important feature of the new release is the dramatic improvement in calculation times. A new generation of solvers (for BEM, FEM and modal extraction) deliver blazing speed when compared to previous revisions. Depending on the hardware platform and the analysis method, solution times have fallen by factors of 10 or more – one analysis case history which ran for 4 days in Rev 5.2 took less than 2 hours in Rev. 5.4.

In addition, LMS has released

Pre/SYSNOISE, a meshing tool that automates the creation of acoustic meshes from the original structural Finite Element model. Once again, the main benefit is speed: another example, the acoustic meshing of a motorcycle gearcase that comprised 7800 structural finite elements was achieved in only 15 minutes. Together with the solver enhancements, this breakthrough in performance means that virtual prototyping of sound and vibration attributes has taken a major step forward in not only being possible – but practical as well.

Other functional additions to SYSNOISE include the acoustic transmission loss of non-planar

structures placed in infinite baffles. Such set-up occurs when checking the acoustic performance of windows, door seals and absorbing panels. It is now possible to predict transmission losses as measured in test chambers to ASTM E90-70 or ISO 140-3. SYSNOISE Rev 5.4 also includes a new library of I-FEM elements licensed from Lucent Technologies. I-FEM offers a speedy FE alternative to boundary elements for acoustic radiation problems.

For more information, contact Bruno Massa, Marketing Communications Manager, LMS International, Interleuvenlaan 68, B3001 Leuven, Belgium Tel: +32 16 384 200 Fax: +32 16 384 350. email: bruno.massa@lms.be Web site: <http://www.lmsintl.com>

NAG Ltd

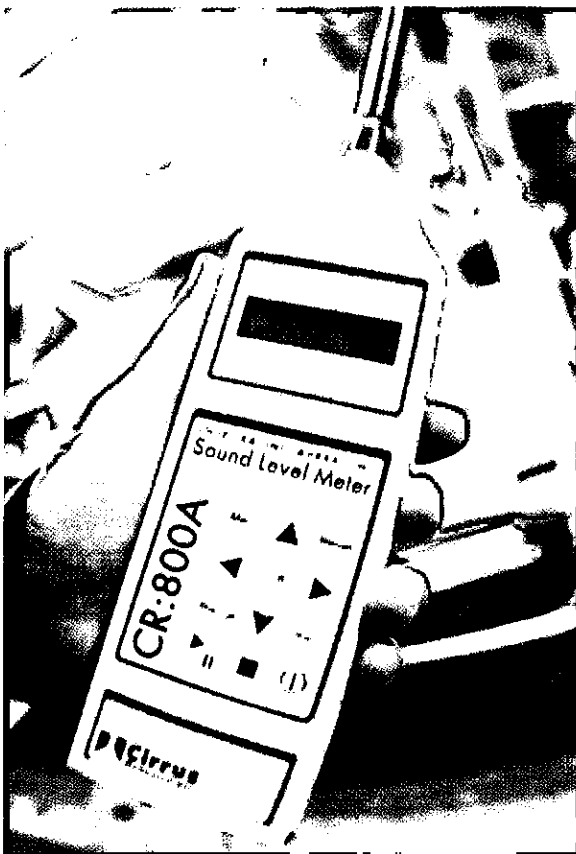
Fortran 2000 features for NAGWare f95 Compiler

The Numerical Algorithms Group (NAG) Ltd has issued Release 4.0 of their NAGWare f95 Compiler. NAG produced the world's first Fortran 90 compiler and now, with Release 4.0, implements features that will be included in the next standard, Fortran 2000. NAGWare users therefore can take advantage of these constructs while retaining the proven reliability and stability of the NAGWare compiler.

Release 4.0 includes features defined in two major Technical Reports, commissioned and accepted by the committee responsible for the development of the Fortran standard (J3):

1. Allocatable Components. The ALLOCATABLE attribute is now allowed on dummy arguments, function results and structure components.
2. IEEE Floating Point Exception Handling. Modules are provided to access and control IEEE floating point arithmetic (on machines that support this).

The NAGWare f95 Compiler features extensive compile time and run time checking and at Release 4.0 this has been further enhanced by the major addition of runtime procedure argument checking and subscript checking for assumed size



arrays. Other enhancements include performance improvements in many areas.

For further information contact Liz Jupe, Marketing Communications Manager, NAG Ltd, Wilkinson House, Jordan Hill Road, Oxford OX2 8DR Tel: 01865 511245 Fax: 01865 310139 email: liz@nag.co.uk web: www.nag.co.uk

CASELLA CEL

Environmental Noise Monitoring Kit - CEL 6760

CEL Instruments have announced a new Environmental Noise Monitoring Kit based on the CEL460 Logging Noise Dosimeter.

The new kit provides a low cost solution for applications where noise levels need to be measured for environmental reasons such as site boundaries, landfill sites, factory perimeters, quarries, warehouses and distribution depots.

The small kit case is unobtrusive and can be fixed to a wall or a lamp post by means of a metal bracket or simple reusable tie wraps. Power is provided from a rechargeable battery pack that can give up to a week's running time on a single charge.

The kit can be pre-programmed in the office using the supplied Windows™ software package to monitor over the required time interval and with a regular period for logging two noise parameters. The noise parameters can be selected to suit the individual job to provide the more popular combinations of time average, maximum, minimum, 90% percentile or peak levels.

Up to 53,400 data points can be stored in the meter's memory, which represents the recording of two values at 20-second intervals for up to six days. This easily allows the system to log results from Monday to Friday continuously in its non-volatile memory.

At the end of recording, the saved readings are transferred to a PC, running a copy of dB 12 software, where they can be graphed and inspected. The software also allows results to be calculated over a longer period, daily or hourly, for example.

The new CEL6760 kit will appeal to organisations which need to monitor noise levels on an occasional basis, when an initial base line survey needs to be carried out and the low cost enables multiple meters to be deployed for surveys that need parallel measurements made at a number of different locations.

Hand Arm Vibration Meter CEL-90259

HSE recommendations and proposed revisions to ISO 5349 (the standard giving guidelines assessment of workers' exposure to hand-arm vibration) require an evaluation of the frequency weighted vibration involving a combination of measurements in three axes.

The latest revision of the CEL-90259 Hand Arm Vibration meter already has a routine which prompts the user, whilst the measurement run is automatically paused, to move the single accelerometer to the next axis, and so on. The resultant vibration total value is then calculated automatically at the end of the run. Although using a single accelerometer is satisfactory for many applications, for others it can be time-consuming and unmanageable.

To solve this problem, CEL have produced the tri-axial kit. It allows three accelerometers to be used at once without the need to disconnect cables or move accelerometers, thus simplifying the entire process. (No changes are needed to the instrument's current operating system with the exception of some older instrument versions which can easily be upgraded).

The optional tri-axial kit comprises two additional accelerometers, cables and a switching box and the addition of this simple accessory will provide both existing and prospective users with time and 'ease of operation' benefits.

For further details about these products please contact: CASELLA CEL, Part of the Casella Group, Regent House, Wolseley Road, Kempston, Bedford MK42 7JY Tel: 01234 844100 Fax: 01234 841490 email: info@casella.co.uk website: www.casella.co.uk

Casella CEL are Key Sponsors of the Institute.

NEWS

ON THE MOVE AFTER 28 YEARS

Prof Keith Attenborough FIOA

Professor Attenborough, who founded the acoustics and noise control programme at the Open University in 1970 and who has been Chief Examiner for the Institute's Diploma since 1998, has moved to the University of Hull to become Head of the new School of Engineering. There he has joined another Liverpool University alumnus, Professor Alan Cummings MIOA, well known for his work on aircraft and exhaust silencers. By combining this with Keith's expertise in outdoor acoustics and sound propagation in suspensions and emulsions, they hope to make Hull a significant player in UK acoustics research and teaching.

THE NOISE CONTROL CENTRE

New Manager

The Noise Control Centre, Architectural and Building Services Division, in Wokingham, Berkshire, has appointed Mr Roger Kelly as Sales and Technical Support Manager.

Mr Kelly, who has an MA in Engineering and an MPhil in Environmental Design in Architecture, commenced his career with Ove Arup & Partners in 1988 as a sponsored student, joining Arup Acoustics' London office in 1993 with a short secondment to Sydney and Istanbul in 1996 and a longer spell in Sydney from 1997 to 1998. During this time one of his major projects was to be a member of the design team for the acoustic design of the Istanbul Cultural Centre. Since then Roger has been a self employed consultant working for both Arup and Fabritrak.

The Noise Control Centre is a Sponsor Member of the Institute.

ATL

Monoglass Now Available in UK

Monoglass glass fibre spray-on insulation is now available in the UK. It is a cotton-like and non-

combustible material which is pneumatically applied, sealing cracks and holes, such as plumbing and electrical outlets to reduce sound leaks.

Further information from Graham Weeks, ATL, 106 New Road, Ascot, Berks SL6 8QH Tel: 01344 882314 Fax: 01344 305313 web www.monoglass.com.

HEPWORTH ACOUSTICS

Two new offices

Hepworth Acoustics Ltd have recently opened two new offices at Horsham and Sheffield with additional staff as part of the planned growth of the company to provide a high level of service to both local and nationwide clients.

For further information on the Horsham office contact Robert Peirce, Hepworth Acoustics Ltd, Meadow Court, Faygate Lane, Faygate, Horsham RH12 4SJ Tel: 01293 852214. And for information on the Sheffield office, contact Matthew Gascoigne, Hepworth Acoustics Ltd, The Innovation Centre, 217 Portobello, Sheffield S1 4DP Tel: 0114 224 2428.

SOUND REDUCTION SYSTEMS LTD

Expansion leads to change of name and address

Hartnell & Rose have been manufacturing acoustic products for the building industry for eighteen years. To more readily identify the nature of their business as a manufacturer of sound reducing products the company has changed its name to Sound Reduction Systems Ltd. The directors and personnel all remain the same.

Coinciding with the change of name is a move to a new manufacturing plant, providing more than twice the manufacturing capacity of the existing plant, enabling them to meet the increasing demand for their products. It will also provide the ability to develop and introduce new products, one of which will be announced later in the year.

Sound Reduction Systems Ltd, Adam Street/Lever Street, Bolton BL3 2AP Tel: 01204 380074 Fax: 01204 380957

HIGGINSON ACOUSTICS

Instruments Used to Measure Human Vibration

A study is being undertaken jointly by Higginson Acoustics Ltd and A V Technology Ltd on behalf of the Department of Trade and Industry, to assess the need for services in the UK to provide type evaluation, verification and calibration of measuring instruments used to assess levels of human vibration.

Both of the main forms of human vibration are of interest in the study, that is hand-arm and wholebody vibration. The objects are to gauge the extent of the demand for services to validate the measuring instruments and to develop views on the form such services might take.

Any person or organisation wishing to contribute information for the study should contact either Roger Higginson at HAL, Tel: 01344 426437, e-mail higginson@csmannetlink.co.uk or Mike Hewett at AVT Tel: 0161 491 2222, e-mail avt_nv@ukonline.co.uk

PENN STATE UNIVERSITY

Acoustic Microscopy

A new scanning device developed by researchers at Pennsylvania State University is helping aerospace engineers monitor the potential effects of 'bird strikes' on the new composite materials being developed for use as turbine blades in aircraft engines.

The technique will enable greater use of composite materials in aircraft engines by allowing researchers to examine the internal characteristics of composite engine parts as they are mended (healed) in-situ.

The new device can be used to test the internal structure of other materials and can also be used by microelectronics companies to look for defects below the surface of computer chips or to study structural detail in integrated circuits. (Source: *Materials World*)

For further information contact Andrew McLaughlin Tel: 0171 451 7395 Fax: 0171 839 4534.

WIMTEC ENVIRONMENTAL Overground Underground Noise Map

Wimtec Environmental Limited is involved in one of the UK's first large scale noise mapping projects for London Underground Limited (LUL). The project is nearing completion and has involved modelling operational noise from trains for the entire above ground London Underground network - 230 km of line. The SoundPLAN prediction package has been used with source data based on over 400 measurements of train passbys carried out by Wimtec. The resulting database has been used to generate noise maps in conjunction with LUL's Asset Information System.

Assessment criteria for the effects of railway noise exposure on residential property have also been developed as part of the project. The results of the study will be used as a baseline against which future changes to the network may be evaluated.

As this immense noise mapping exercise is being carried out in only nine months, it has been necessary to subcontract some of the noise modelling. Environmental Resources Management, Kirby Charles Associates and Moir, Hands & Associates are the consultancies involved in this work.

For further details contact Steve Summers Tel: 01753 737744 or e-mail steve.summers@wimtec.co.uk

MULTI-SCIENCE

On-line Subscriptions

Multi Science is now offering on-line subscriptions to Noise & Vibration Worldwide which is published 11 times a year.

The year's on-line subscription will cost only £25, compared to £145 for the print version.

For more information, e-mail sciencem@hotmail.com, or view the web site, www.multiscience.co.uk

Items for inclusion in this section should be sent to John Sargent MIOA, Oak Tree House, 26 Stratford Way, Watford WD1 3DJ. ❖

NOTE IDENTIFICATION IN POLYPHONIC MUSIC

Julian Wagstaff

RoboSens Ltd, based in Edinburgh, have released a low-cost software product entitled GUITARMASTER, which produces song sheets in standard musical notation and digitised MIDI files from chord sequences played on a standard electric guitar. The system processes the raw analogue audio signal produced by the instrument and no additional or specialist hardware is required.

By 'polyphonic' music is meant music in which more than one note is sounded simultaneously, such as chord-based guitar music. This is in distinction to monophonic music in which only a single note is played at any given time (for example a musical line played on a flute).

The key tasks involved in transforming the polyphonic audio signal produced by the guitar into musical notation and digitised musical (MIDI) information are twofold:

- The individual fundamental frequencies (notes) contained in a particular chord must be identified.
- A rulebase must be applied to the resulting information in order to make sense of them in a musical context.

The note identification system operates by sampling the incoming monaural audio signal at 22050 Hz. This is carried out using a standard sound card, and using the standard audio processing functionality provided by MS Windows. The data is stored in 16 bit mono WAV format. Two interrelated problems required to be addressed with respect to signal processing. These relate to the fact that the sound signal is highly dynamic in nature. As the instrument's strings are struck at the start of each new chord, spurious noise is produced. Furthermore, the notes actually produced by the strings distort somewhat as the strings stretch when struck at moderate velocity.

To prevent these effects from distorting the frequency analysis of a given chord, it was necessary to ensure that our FFT data window starts *after* the initial 'strum', and finishes *before* the subsequent one. In addition, the maximum size of a data window is restricted to approximately 1.5 s, to avoid the problems associated with sound decay. To this end, the entire WAV file is first analysed to locate the strums, which are then tagged. This is achieved using a simple gradient detector over a range of approximately 0.05 s. The overall average level is also assessed, and sections of the file are tagged as a musical rest if the level falls below a minimum value.

To determine the individual notes (frequencies) contained within the sound signal, the sound data is analysed using a standard FFT process. The sound is pre-processed using a simple smoothing algorithm, which averages each sample over its two adjacent values, to eliminate spurious noise from the input signal. This is non-recursive. In addition a PARZEN type (ie triangular) data window is applied to eliminate noise which would otherwise be caused by the sudden start and end of the sampled data.

To increase the accuracy of the frequency plot pro-

duced by the FFT, the data is null-expanded at either end by an overall amount of 100%. The 100% figure was determined to be optimal through experimentation with different values.

The sound data is then processed, with a minimum of 3 FFT's fitted into the period between each strum, and the length of the FFT samples adjusted to the maximum possible value, limited to a specified maximum.

Each FFT data set is then processed using a peak detection mechanism. This locates peaks in the data (ie potential musical notes) by reference to the average noise level and a minimum peak width. As peaks are found, harmonics of these are eliminated. This is critical, as in guitar audio signals significant harmonics are generated at up to 3 or 4 times the fundamental frequency for each string. If these were detected as notes, they would cause potential miss-identification of the chord played.

Ideally, it would be desirable to determine precisely which frequency peaks located by the FFT were actual notes played by the musician, and which were harmonics of lower notes sounded by the player. Although we experimented with analysis of FFT phase information and of relative amplitudes, neither of these techniques produced reliable results. Instead the problem was addressed at a later stage in the process by using a musical knowledge base to re-insert harmonics such as octaves (2xfundamental) and octaves-plus-a-fifth (3xfundamental) into the chord voicing.

Once each sample has been processed in this way, the resultant note list is stored in a temporary file in a proprietary format, to be processed by the chord identification rulebase. This applies musical knowledge to the frequencies found to convert them into note names (eg 110 Hz maps to A natural), and to determine possible chord names for the collections of notes constituting the chord. Tempo information supplied by the user is correlated with the strum start and end information to allocate the chords identified to specific beats in the bar. This information is then used to produce a graphical representation of the music in standard notation and guitar tabulature with chord symbols, and a standard MIDI file compatible with virtually any PC in the world.

The overall system framework was developed in MS Visual Basic, while all of the low level mechanisms for processing the sound samples were realised in C code, and compiled into a DLL which is called from the VB code. This approach was selected both for reasons of convenience and in order to optimise the code for speed of execution.

More information on GUITARMASTER is available from <http://www.robosens.demon.co.uk>

Julian Wagstaff is Managing Director of RoboSens Ltd, Catchpell House, Carpet Lane, Bernard Street Edinburgh EH6 6SP. ❖

Response to 'Tenants Beware' – Newsletter from Messrs Ottaways Solicitors printed in the May/June 1999 issue of Acoustics Bulletin

From Dani Fiumicelli AMIOA

The Editor

Dear Sir

I would like to comment on the extract of the newsletter regarding inadequate sound proofing published in the May/June 1999 edition of the Bulletin.

The statement in the newsletter appears to be based on the Appeal Court decisions in the cases of Baxter vs London Borough of Camden (Nov 1998) and London Borough of Southwark vs Mills (Aug 1998), both of which concerned inadequate sound insulation between dwellings. These decided, amongst other issues, that :

- A landlord cannot be held liable for nuisance arising from poor sound insulation because the law deems that tenants know the sound insulation characteristics of premises they let at the time they take on the lease, even though the judges recognised that this is very unlikely, describing it as *albeit a fiction* in their judgement. Therefore the concept of *Caveat Lessee* – let the lessee beware – applies, and a tenant cannot complain of nuisance arising from poor sound insulation once they have accepted the lease on a property.
- Noise arising from the ordinary reasonable use of a neighbouring dwelling cannot be a nuisance, even if the resulting noise level transmitted into neighbouring dwellings due to inadequate sound insulation materially interfered with the ordinary reasonable use of the neighbouring dwellings. This is because there was nothing unreasonable or extraordinary giving rise to the noise in the first place.
- A landlord has no liability, under the 'quiet enjoyment' covenant – either explicitly or implicitly – provided for in a lease, to improve premises by upgrading poor sound insulation.

In reaching the above decisions the Judges specifically side-stepped the acoustic issues relating to the cases and concentrated on the legal argument instead. In the case of Baxter vs Camden, the Appeal Court Judges state they were impressed with the evidence of the acoustician who provided expert evidence on the inadequacy of the sound insulation and recognised that Ms Baxter was plagued by noise from the ordinary reasonable use of the flats above and below her. However the judges gave the acoustic evidence considerably less weight than the argument that this was a matter for Parliament to decide and that to find for Ms Baxter would be an unacceptable extension of the law on nuisance without Parliamentary approval.

Currently occupiers of premises provided with poor sound insulation have little legal means of remedying the problem. However both cases have been appealed to the House of Lords and were heard in early June, the Law Lords office advise that a judgement is not expected before the beginning of August.

However, not every legal avenue of addressing poor

sound insulation has been closed. 'Statutory Nuisance' as defined by section 80 of the Environmental Protection Act 1990 consists of two limbs, nuisance or prejudicial to health.

It is clear that if the decisions in the above cases stand, then the nuisance limb has been closed, but the prejudicial to health limb still remains. The BRE in their guide to the Building Regulations and Health (1995) estimate that upwards of 100,000 households have their health affected by poor sound insulation. Furthermore, Regulation 8 of the Building Regulations 1991 states that they do not require anything other than the minimum necessary to protect the health and safety of persons in and about buildings.

Therefore, I would suggest, the sound insulation values of Approved Document E, Building Regulations 1991, can be regarded as the minimum necessary to protect health. I submit that by establishing that a premises does not meet the sound insulation values of Approved Document E and that noise from the ordinary reasonable use of neighbouring premises is actually transmitted so as to be likely to have a negative health impact associated with noise, eg sleep disturbance, stress, anxiety, annoyance etc, a case can then be made that the premises is prejudicial to health and therefore a 'Statutory Nuisance' exists as defined by section 80 of the Environmental Protection Act 1990, and that the owner of the premises is liable for remedying the problem.

Sound insulation remains a significant factor in degrading the quality of life and health of a large number of households in the UK. The problem can be particularly acute for households unable to exercise much choice in what sort of housing they occupy, eg the young, elderly, disabled, Local Authority and Housing Association tenants. Many of these persons do not have the resources to secure quality housing with adequate sound insulation and must live where placed by their landlord or where their circumstances allow. Even if these persons are aware that the sound insulation of their proposed dwelling is poor, they have no means of exercising choice to live somewhere else with better sound insulation and if they decline housing with poor sound insulation may well have nowhere else to live.

Even if the Law Lords uphold the Appeal Court decisions referred to above, the problem of inadequate sound insulation does not go away and will continue to seriously affect a large number of persons. Sound insulation was at one stage included in the Government's review of the housing fitness standard currently under way, but was dropped. Possibly the Institute of Acoustics could contribute to the debate by supporting the reinstatement of sound insulation in a revised housing fitness standard. Then occupiers of premises with poor sound insulation could obtain some degree of relief and owners could obtain financial assistance, subject to a test of financial resources, to remedy the problem.

dF Acoustics,
17 Village Way,
Beckenham, Kent
BR3 3NA

Acoustics Recruitment Associates

150 Craddocks Avenue Ashted Surrey KT21 1NL

Tel: 01372 272 682 Fax: 01372 273 406

e-mail: ara@dial.pipex.com

Technical Adviser: Dr Geoff Leventhall

In addition to a number of vacancies for Consultant and Technical Sales we have the following rather special ones.

Technical Manager of a Major UK Noise and Vibration Hardware Company

We are looking for someone with experience, a good technical/academic background and excellent forward vision, who is able to guide the company through its next stages of development.

Senior Transport Noise Researcher

Mainly research on tyre/road noise. Experimental but with opportunities for theoretical modelling. Customer contact and business development are also within the scope of the work. You should have a relevant first degree and experience and be computer literate. The post carries an excellent benefits package.

Contact us for a preliminary discussion on these vacancies.

Institute Education Programme

Diploma in Acoustics and Noise Control

A postgraduate course usually studied over one year which covers the principles of acoustics and sound transmission. It is also the recognised professional training for those involved in the control of noise and vibration in the environment and workplace.

Courses at ten Accredited Centres and by Tutored Distance Learning. Satisfies the academic requirements for corporate membership.

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A five day course aimed at meeting the requirements of the Competent Person described in the Noise at Work Regulations.

Certificate of Competence in Environmental Noise Measurement

A five day course aimed at producing delegates who are able to make and report environmental noise measurements in a competent manner.

Certificate of Competence in the Measurement of Sound Transmission in Buildings

A five day course aimed at producing delegates who are able to make and report on sound insulation measurements in a competent manner.

Further information from Institute of Acoustics Tel: 01727 848195 Fax: 01727 850553 email ioa@ioa.org.uk

