

ACOUSTICS

BULLETIN



in this issue... **Achieving Great Concert Sound**

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ACOUSTICS

BULLETIN

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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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Dear Members

I am delighted to report that by the end of 2005 the Institute had achieved two new milestones; we passed the threshold of 2500 individual members, and 2005 proved to be our most successful financial year ever. Sustained demand for our services together with excellent fiscal management has enabled us to satisfy our policy on monetary reserves, established by Council in 1999, thus now availing us even greater focus on our ongoing objective of shaping the Institute's future. In this vein, I am confident that your input from the recent members' questionnaire will advance our progress towards a raised profile, increased influence, better engagement with younger members, enhanced membership services and improved headquarters resources.

Now, another historical moment is nigh: Roy Bratby is retiring after nearly nine years unstinting effort as our Chief Executive. Roy will be a hard act to follow, but I am pleased to announce that our new Chief Executive will be Kevin Macan-Lind. Kevin has an entrepreneurial business background and considerable experience of working with organisations operating via committees and working groups. Roy will be staying on for a couple of months to ensure a smooth transition, and I anticipate that Kevin will soon be ready to make his mark. As both of them will be at the Spring Conference you'll have the opportunity there to meet Kevin and to buy Roy a thoroughly well-deserved drink!

The 2006 AGM will see several changes in Council membership, and Council will be recommending a slate of candidates to maintain a balanced representation across the Institute's range of activities. I hope that you will concur with Council's nominations, but alternative candidates may be put forward as set out on the AGM notice. Some long serving members will be leaving Council and I am happy to express my gratitude for their valued contributions, while also looking forward to the new intake's involvement.

As I write this, the last of my twelve President's letters, I now know just how rapidly two years of Presidency can fly by: it's certainly true that time passes quickly when you have been enjoying yourself! I am satisfied with the progress that has been made, and offer my thanks to all of you who have actually done the hard work, whether as a member of one of our many committees, or by being involved in consultation exercises, organising meetings, providing our educational programmes, representing the Institute on external bodies, carrying out publicity and information initiatives, or simply by participating. Also, I am only too pleased to state my appreciation for the sustained efforts of our dedicated headquarters staff. Of course, much remains to be done and I am confident that Colin English, who will take over the Presidential reins at the AGM, will be more than a match for the demands. I look forward to working with Colin, and I'm sure you will continue to give him the support with which I have been kindly favoured.



Tony Jones

PRESIDENT



Meeting Report

Adrian Popplewell MIOA. **Auralisation: Hearing is Believing**

Do we believe what we hear? Should we believe what we hear? These were the questions posed at the beginning of the Building Acoustic Group's latest one day meeting. Nearly forty delegates gathered on a slightly chilly January morning in a dance studio in Brixton to try and answer these and many other questions around the topic of auralisation.

During the morning session there were four presentations by **Mark Gaudet**, Andrew Mitchell, Tim Scott, Paul Gillieron and Seb Jouan. Mark, from Bickerdyke Allen Partners, started proceedings with his consultant's eye view of how auralisation can be used as a practical tool in agreeing a brief with a client, by presenting to the client the acoustic effects of a design brief. He recently presented two auralisations to the BBC to help assist the decision making process. The first presented the result of different construction noise activities that would be audible in radio studios. The second presented the sound break-through from one studio to another as a result of the sound insulation performance which was being proposed.

Not only was it possible to replicate the level of noise resulting in a studio, but the noise environment was made specific by replicating the services noise spectrum of a particular studio, as well as the underground train noise spectrum. In fact BBC studio managers were able to identify the studio being auralised from the sound of the services noise and tube noise alone.

Mark has found this type of auralisation is extremely useful in demonstrating important acoustic criteria to the client. Using real sound from BBC studios, he played it at studio levels, attenuated it using software, then played it at levels audible in adjacent studios. The auralisation was the basis for agreeing the sound insulation brief on the Broadcasting House redevelopment project.

Andrew Mitchell, from the Centre for Energy and the Environment (CEE) at the University of

Exeter, then discussed how the CEE has developed a number of tools to produce auralisations demonstrating the effect of a particular level of sound insulation or reverberation. Since the introduction of Building Bulletin 93, these tools have been used to assist education authorities and individual schools when deciding whether alternative levels of acoustic performance are appropriate, rather than those specified in Building Bulletin 93.

The normal way of demonstrating compliance with BB93 and hence the Building Regulations is by conforming to the numeric criteria specified in the Bulletin.

There are problems with the use of numeric criteria, namely:-

- single-figure ratings are frequently used (e.g. R_w , T_{mf}), which will not fully characterise the effects of frequency-dependent behaviour on acoustic performance;
- there may be a need to depart from the criteria in response to other conflicting needs, and it will be difficult for non-acousticians (eg representatives from the school or local education authority) to gauge the effect of adopting alternative standards.

By way of illustration, Andrew discussed three specific examples: levels of sound insulation in a music suite and implications for the audibility of noise transmitted from adjacent spaces; the effect of accepting a reduced level of airborne sound insulation from a moveable partition; and the effect of reducing reverberation.

CEE produces simulations by manipulating digitally recorded audio on a computer, using bespoke software. The relatively simple, uncompressed, structure of WAVE audio files has been exploited, and the software coding is in Visual Basic, except for intensive routines when C++ DLLs have been used.

Tim Scott and **Paul Gillieron** (Paul Gillieron Acoustic Design) described their experiences of ambisonic auralisation using a system based around the Lake Huron 24-channel convolution processor and CATT Acoustic 3D modelling software. Combined with a sophisticated three dimensional visual interface, their knowledge and capability has been exploited by artists as well as bands such as Erasure. One recent installation is the 'Aurora Exhibition' where the radio wave interference caused by the aurora borealis was reproduced and used in a musical composition. Another artist has incorporated both sound and light into a public work of art representing clouds, known as 'The Hub' in Workington, Cumbria.

To round off before lunch **Seb Jouan**, Arup Acoustics, described the use of the Arup Soundlab, a series of dedicated auralisation rooms where acoustic designers can listen to their buildings before they are built to inform their designs, and where such design and understanding can be communicated to the future buildings users and clients. The SoundLab was calibrated by comparing the acoustic characteristics of existing buildings with the ones created specifically for SoundLab and now allows for room acoustics, building acoustics and public address intelligibility auralisations. With over 20 project specific auralisations under their collective belt since the inception of the first SoundLab, Seb and his colleagues have used the system to design such projects as Heathrow Terminal 5, Florence Railway Station and the Sage Gateshead.

The afternoon was taken up with three interactive sessions running simultaneously; small group discussions enabled delegates to share their own experiences and uses of auralisation techniques and there was opportunity to grill the morning's speakers on their work and to listen again to the audio demonstrations presented previously. Paul and Tim also very kindly demonstrated their CATT/Lake Huron based system in slightly more controlled conditions than during the morning's presentation. Small groups of us were shown into their small, purpose built studio. Originally created during the design of the National Centre for Popular Music in Sheffield in 1999 this space now houses their ambisonic system, which was demonstrated. This presented a fantastic opportunity for everyone to hear such a system in use and to ask questions of regular users, and provided a valuable learning opportunity, particularly for those delegates who were less experienced in the techniques involved.

The day closed with a lengthy discussion session chaired by **Bob Essert**, Sound Space Design. This was an opportunity for the delegates to bring together everything discussed and learnt and heard throughout the day. With wide ranging discussion and feedback on topics such as the types of application in which auralisation is being used day-to-day, to the relevance of absolute levels, and experiences of equalising the presentation spaces and the electroacoustic chain, this was a fitting end to a successful and fascinating day.

The Building Acoustics Group committee would like to thank all the speakers and delegates for their invaluable contributions, and Paul Gillieron for providing the venue and hosting the event.



Delegates share their experiences at a group session

Meeting Report

Paul Pitts MIOA. **Let's Get Physical:** A seminar on the Control of Vibration and Control of Noise at Work Regulations 2005

The Measurement and Instrumentation Group's re-run of the 'Let's Get Physical' meeting, first held in July 2005, was held on Thursday 1 December 2005. The delegates were from a range of disciplines, including engineering employers, manufacturers of instrumentation and control products, and safety professionals.

The meeting theme was the Control of Vibration at Work Regulations 2005 that came into force on 6 July 2005, and this dominated the event. The vibration regulations are the first to introduce action and limit values for hand-arm and whole-body vibration exposure.

The venue was the Health and Safety Laboratory (HSL), housed in a new purpose-built laboratory on the hills overlooking Buxton and the Derbyshire Peak District. Unfortunately the dense fog that engulfed most of the North-west and Midlands that morning prevented delegates from enjoying the view.

Paul Brereton from the Health and Safety Executive presented the first paper of the day. He outlined the purpose and requirements of the Control of Vibration at Work Regulations. Paul had a hand in the drafting of the regulations and the accompanying HSE guidance and so was able to explain the responsibilities of employers, and HSE's expectations of employers when there is a risk from either hand-arm or whole body vibration exposure.

Employers also have to consider the risk of civil litigation. The second speaker, **Philip Bladon**, of QBE Insurance, addressed the likely impact of the new vibration regulations on the risk of Hand-Arm Vibration Syndrome (HAVS) injury claims, and the financial implications to the unwary employer. Where claims arise Philip emphasised the importance not just of vibration assessment and control but of keeping complete records for use as evidence of good practice, both current and historic.

Paul Pitts from the Health and Safety Laboratory, the host of the meeting, gave a short presentation outlining the revision to International Standard ISO.8041 that deals with instrumentation for measuring human exposure to vibration. He discussed the changes the standard introduces and looked forward to instruments that comply with this updated standard.

The meeting then considered the practical matters of hand-arm vibration exposure. **Sue Hewitt** from HSL described how information on vibration magnitudes can be obtained for a hand-arm vibration risk assessment. She considered the use of manufacturer's emission data from standard tests, sources of information on the vibration level in use, and measurement of the vibration magnitude. She demonstrated using a large number of HSL test results the large spread in vibration levels on the same tool. She recommended obtaining in use

vibration levels from manufacturers or other organisations and databases and advised caution in sole reliance on limited measurements because of the large variability in vibration magnitudes. Her results showed the emission data from standard tests generally under estimates the actual vibration level in use and she gave multiplication factors that could be used to make an estimate of the vibration level in use, when no other data was available.

Baz Clarke from the Engineering Employers Federation then followed with some entertaining practical tips for reducing vibration exposure. Speaking from personal experience he spoke in depth about tool maintenance, the selection and use of low vibration tools, and replacing high vibration processes with lower vibration alternatives as well as reducing exposure time. He also advised on the pitfalls where supposed solutions can be ineffective or increase the vibration exposure.

Alison Codling of HSL's Medical Unit, gave the final paper on the subject of hand-arm vibration. Alison spoke about health surveillance for hand-arm vibration. She took us through the HSE guidance and gave practical advice on setting up a surveillance programme and the actions to take should someone be diagnosed with hand-arm vibration syndrome (HAVS).

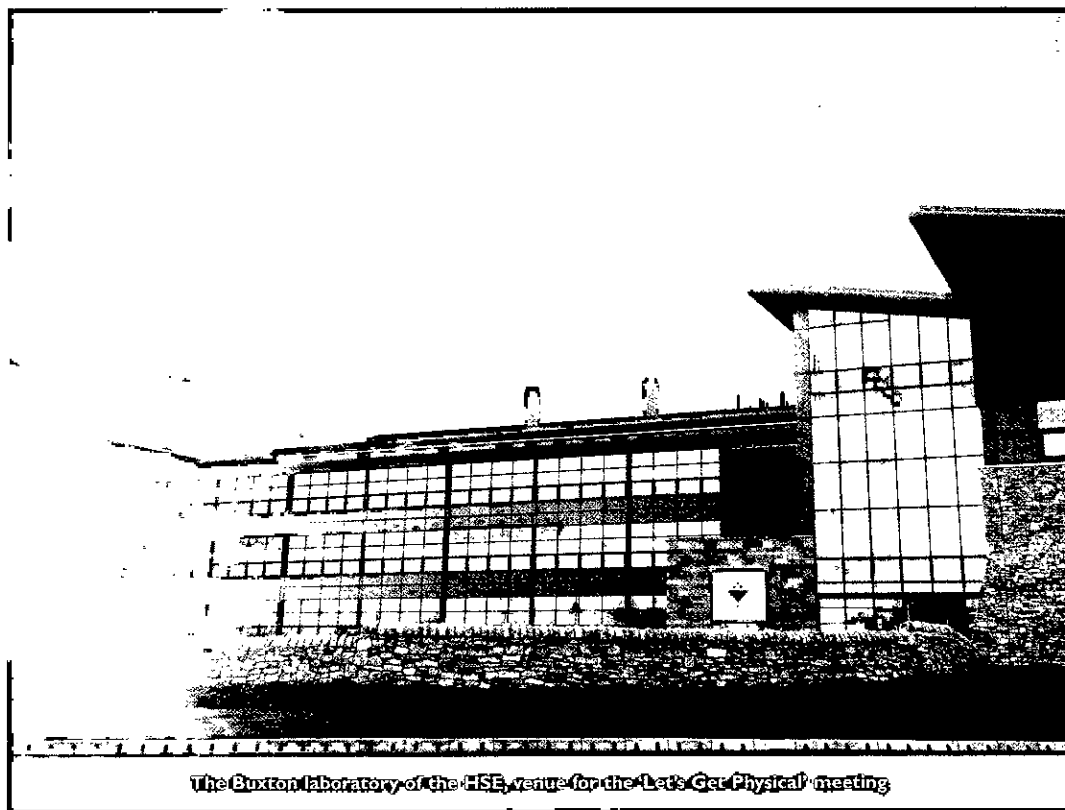
The afternoon session covered whole body vibration exposure. **Alison Darby** from HSL gave an excellent practical introduction as she talked from her own experience about the

assessment of whole body vibration exposure and the assessment of the contribution of other ergonomic factors to risk.

Miles Pixley from JCB presented a paper on the reduction of vibration exposure in vehicles. He covered the employer's duties under the regulations from a practical point of view. Then he went through the vibration control measures including the need to select the right machine for the job, ensuring that the vehicle and driver's seat are properly maintained and used, training the driver to operate the machine smoothly, and keeping to the correct speed over the terrain.

The final paper of the day was presented by **Simon Mills** from British Gypsum who gave us a case study of the improvements to the control of whole body vibration exposure in a Gypsum mine. He covered not only the successful controls, but those that had proved to be dead ends so that we all had a useful insight into the practicalities, pit falls and likely reduction in vibration exposure that different measures might be expected to give.

After the meeting, there was an opportunity to see demonstrations of the subjects included in the seminar in a tour of some of the laboratory facilities. Most delegates chose to come on this brief laboratory tour where they saw demonstrations of hearing loss, hand-arm and whole-body vibration measurement and control and the HAVS diagnostic test facilities.



The Buxton laboratory of the HSE, venue for the 'Let's Get Physical' meeting

Meeting Report

Sam Bell MIOA.

Irish and Scottish branches: joint meeting on sound insulation in dwellings

A one-day meeting on Sound Insulation in Dwellings organised by the Irish and Scottish Branches of the IOA was held in Dublin on 25 November 2005. The meeting was well attended: 106 delegates considered the topic to be worth the trip to Dublin.

First, **Gary Duffy** of Fononic / Brüel & Kjær gave a general overview of the parameters used in sound insulation testing. This was aimed at the general audience who may not necessarily have had knowledge of some of the finer points of acoustics. The presentation introduced the idea of a single number rating index and explained the relationship between the components of partitions and the frequencies that were reduced by them. Naturally the remaining presentations focused heavily on $D_{nT,w}$ and frequency-dependent reductions, so this presentation was an important part of the meeting for those new to the subject.

Chris Dilworth of AWN Consulting summarised the current Irish Building Regulation requirements and offered an insight into their shortcomings and common misinterpretations. He then presented the results of almost 400 sound insulation tests conducted in Ireland over the past 18 months. Mean values of wall performance ranged from 53dB $D_{nT,w}$ for concrete blocks with plasterboard on dabs, to as much as 62dB $D_{nT,w}$ for timber framed constructions. Some of the individual values for the blockwork construction were alarmingly low, with 32% of the examples tested failing to achieve the nominal goal of 52dB $D_{nT,w}$. He went on to offer some observations in relation to subjective performance, with particular emphasis on those situations where the insulation is considered subjectively poor even though measured values would seem reasonable.

Nick Antonio of Arup Acoustics gave a presentation detailing the logic and reasoning behind the Building Regulations and the Approved Documents for England and Wales. He examined the need for the protection of householders, briefly described each revision of the regulations through to the latest version, and gave the basic philosophy of each. He went into some detail for the latest Approved Document E and examined the testing requirements and their efficacy. He finished by looking into the future of the Regulations, by examining where there needed to be further assessment, and considered what future improvements might be made.

Sean Smith from Napier University outlined the primary changes which came into force in Scotland on 1 May 2005 with the change from Part H of the Technical Standards to 'Section 5: Noise' of the Domestic Technical

Handbook. The key change has been the move from 'deemed-to-satisfy' constructions to 'guidance' constructions. In addition, the new Technical Standards now adopted the EU Construction Products Directive (CPD) groupings, such as Structure, Fire, Environment, Safety, Noise and Energy.

During the switch to the Domestic Technical Handbook some of the content covering guidance constructions was modified. Examples include the use of render coats for masonry walls with dry linings, and resilient bars for timber separating floors. Further guidance was given on the use of floating floor treatments and the application of levelling screeds on precast wide-slab floors. Many of the modifications to the standards stemmed from a report undertaken for the Scottish Executive in 2001 by the Building Performance Centre at Napier University.

At present, Robust Details do not operate in Scotland, and perhaps during the standards review in 2006 this system and the use of post construction (or pre-completion) testing (PCT) may be assessed for possible inclusion in future amendments. Finally Sean mentioned a book due to be published in early 2006, funded by the Scottish Building Standards Agency, Historic Scotland and Communities Scotland: 'Housing and Sound Insulation – improving existing dwellings and designing for conversions' will also be available in a web interactive version.

Following lunch, **Iain Critchley** of Peninsular Acoustics gave a short description of what was entailed in performing a sound insulation test. During his presentation he included a number of points of experience from the

many tests he has performed as an approved tester through the pre-completion testing scheme being run by the UK Association of Noise Consultants.

Dave Baker from Robust Details Ltd gave an overview of the Robust Standard Detail option (as against pre-completion testing) for the practical implementation of the 2003 Approved Document E of the current England and Wales Building Regulations. Dave talked through the details currently offered as part of the scheme and highlighted those that were most popular. As part of the scheme to ensure that the details were indeed robust, inspections and performance monitoring were an ongoing part of the works covered by Robust Details Ltd.

Iain Critchley then returned to give a 'An overview of ANC pre-completion testing'. With the implementation of the Approved Document E 2003 (AD-E) of the England and Wales Building Regulations it became mandatory that a programme of sound insulation testing be performed before dwellings were occupied (unless the buildings are built using one of the approved Robust Standard Details). In order to comply with this requirement the UK Association of Noise Consultants (ANC) has set up a Registration Scheme whereby members of the Association can become approved testers and, subject to a favourable test result, a Certificate of a Measured Sound Insulation of a Wall or Floor will be issued direct to the developer by the Association of Noise Consultants. Iain talked through the experiences of the testers in relation to common problems encountered with wall and floor constructions. A failure rate of 10% or less is now found compared with the estimated 25% to 50% prior to the implementation of AD-E 2003, although it was the case that not all PCT was being performed via the ANC scheme: it may also be that not all failures are being reported (as a developer would then be charged for an



Speakers and VIPs at the Sound Insulation meeting: (l to r) Sean Smith, Martin Lester, Gary Duffy, Alistair Somerville, Nick Antonio, Iain Critchley, Chris Dilworth, Tim Waters-Fuller, Andy Irwin, Lillanne Lauder.

initial test and a re-test).

Tim Waters-Fuller from Napier University provided an overview of the mechanisms and measurement of impact sound transfer, reviewed the regulatory requirements across the UK and Europe and presented measurement data comparing the performance specification for underlay materials, ΔL_w , against the final impact insulation performance achieved with a hardwood floor surface in-situ.

In respect of the Building Regulations, it was concluded that the minimum regulatory impact performance requirements across all UK countries were less onerous than those European countries considered, although the pre-1985 AAD criteria were comparable with the current French and Danish requirements. The Norwegian and German requirements are significantly more stringent.

The specifications for underlay materials given in the Building Standards documents for use with Type I concrete floors are provided as either a minimum 4.5mm thickness or as a minimum performance criterion, ΔL_w of 17dB. It was shown that this measure is not equally applicable for timber floors or once hardwood flooring is laid. The ΔL_w criterion, which was determined from impact measurements made on the resilient material, significantly overestimated the actual performance improvement when used under a hard floor finish, with final impact sound performance limited to 5dB for the basic timber floor, and 23 dB for the concrete floors considered.

The final presentation was given by **Andy Irwin** of AWN Consulting. Andy recapitulated AWN's recent experience in Ireland (as discussed earlier in the day by Chris Dilworth) and then talked through the alternative construction methods in comparison with the current trend in Ireland for plasterboard on dabs, on either bare block walls or blockwork with a base scratch coat. The fixing of the plasterboard on dabs appeared to produce a pronounced 'dip' in the sound insulation performance typically above 1.25kHz. This appeared to be consistent with the subjective comments that in some circumstances conversations in one half of a semi-detached dwelling could be heard and understood in the other half. The discussion of the many alternatives showed that whilst they may not be the preferred choice of the builders, there were high-performing alternatives to the use of plasterboard on dabs.

Discussion periods through and at the end of the day appeared to be enjoyed by all, as was the adjournment to the bar and visit to a restaurant in the centre of Dublin later in the evening.

Call For Papers

Harmful? - Judge for yourself! Measurement and Instrumentation Group

Making the vibration regulations work safely: 17 May 2006, Society of Chemical Industry, London.

The Control of Vibration at Work Regulations 2005 placed on employers the explicit duties of managing risks to workers by assessing their exposure to hand-arm and whole-body vibration. Vibration emission values from equipment are often difficult to identify. Test methods and test codes have, in the past, produced values of questionable use in the workplace. What factors can be applied to develop declared values, for the particular operation, and to assess and manage any risks?

This important meeting will provide information and advice for workplace managers, health and safety officers, equipment manufacturers and employers groups. Now is the time to explore the implementation of the Regulations for the Control of Vibration at Work. Employers have to assess the work process, determine if any test code data supplied by the manufacturer of machinery applies to the process, or measure directly due to deficiencies in test code data, and then estimate the likely vibration emission. Then, taking into account the uncertainties at each step, they should arrive at a risk assessment.

Manufacturers of equipment that emit vibration need to make emission declarations that are useful in real working conditions.

Contributions have been secured from manufacturers, consultants, insurance companies, trades unions, businesses, safety advisors and consultants. The meeting will cover both hand-arm vibration from hand-guided machinery, and whole-body vibration, and will include the following papers from experts in human vibration:

- Filling the gap between manufacturers' declared values and hand-arm emission under real working conditions
- Exposing the risk from whole-body vibrations with little data
- Test methods and test codes, limitations and correction factors
- HSE expectations for hand-arm vibration risk assessment
- Insurance, the lack of historical evidence and the claims process
- Building a database of vibration emissions under a range of operating conditions
- Managing risk assessment and measures to protect workers.

The one-day meeting is aimed at managers, safety advisors, equipment manufacturers, employers groups, trades unions and insurance companies.

In the final analysis questions are likely to be asked in Civil Courts about evidence for applying correction factors where direct in-use vibration measurements were not used.

For more information please contact the Meeting Organiser, Martin Armstrong, by e-mail:

martin.armstrong@bksv.com,

tel: **01223 262770**,

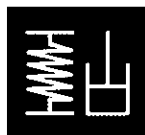
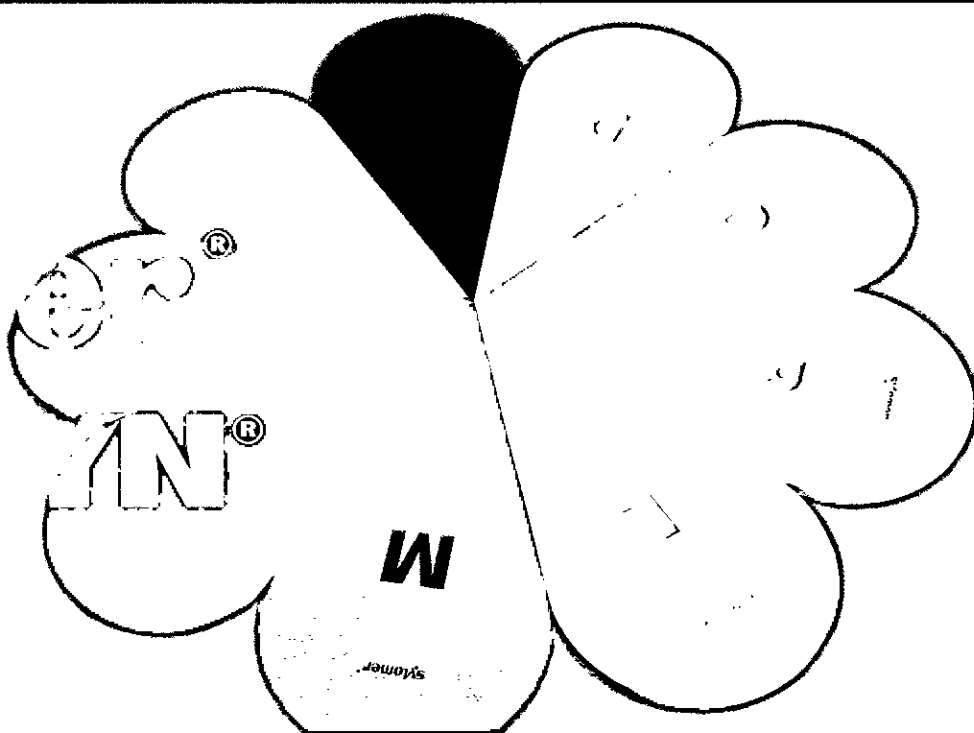
fax: **01223 262770**, or

Linda Canty at the Institute office.



Whole body vibration as experienced by plant operators is covered by the Control of Vibration at Work Regulations

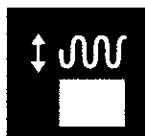
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Meeting Report

Nicola Stedman AMIOA.
London Branch Evening Meeting

The first London Branch Evening Meeting of the new year was held on Wednesday 18 January 2006, at Capita Symonds' office in Holborn. Attendance was high, with a considerable number of new faces in the audience.

Sue Bird, of Bird Acoustics, presented a talk on the Association of Noise Consultants' registration scheme. The evening began with a brief overview of the aims and objectives of the registration scheme and the history behind why the scheme was initially introduced.

When the Approved Document E was first published, it stated that test bodies should be UKAS-accredited, but this would have been costly and there were not nearly enough bodies so accredited to carry out the volume of work that would follow. The ANC responded by setting up their registration scheme. The main benefits of the scheme are to maintain and improve competence, raise standards, ensure consistency, inform the public, represent views of the members, and centralise data collection, as well as allowing for discussion between members on specific topics, such as arithmetic or logarithmic averaging, cabinet speakers versus dodecahedra, and inconsistencies in rounding.

The ANC has identified that approximately 2000 pre-completion tests are currently undertaken each month. In addition, pre-completion testing has demonstrated that initial failure rates are now around 10% or

lower, compared with 40% to 50% prior to the implementation of Approved Document E, published in 2003.

Many of the practical problems of pre-completion testing were also identified, which many of those attending could relate to. These included unhelpful and uncooperative building inspectors/site managers; background noise, for instance drilling taking place in adjacent rooms; incomplete rooms, where doors and in some cases walls had yet to be fitted; a lack of mains power; no access to upper floors, which necessitated lugging heavy equipment up and down ladders, and difficulties in obtaining accurate information about the construction of the building. A number of

surprising problems were also considered, including the frequent lack of toilet facilities, and it was also mentioned that on isolated occasions aggressive and intimidating behaviour was experienced by the consultant when buildings 'failed' and the tester refused to be persuaded to issue a 'pass' certificate!

The talk was followed by a discussion and among the many interesting issues debated, it was revealed that a preliminary analysis of postcodes submitted to the ANC along with the test information highlighted a number of pre-completion testing 'black spots' around the country. It was, however, acknowledged that the ANC did not oversee all pre-completion tests.



A high attendance at the first London Evening Meeting of 2006

Meeting Report

Paul Shields MIOA.
Midlands Branch

The fifth Midlands Branch meeting of the year and AGM was held on 16 November 2005, again at Coventry City Council House, with a presentation from HSE's Tim Ward on the Implementation of Physical Agents Directive – Noise. Tim's talk outlined the content of the new regulations, and gave an insight in to how employers, and those who advise employers, should take forward this revised approach to controlling noise at work. All told, this talk up held the fine standard of all the presentations in this years interesting and varied programme. The formal issues of the AGM were dealt with after the presentation.

The branch committee also held a planning meeting on 23 November 2005 to discuss the programme of branch meetings for 2006.

Meeting Report

Nigel Triner MIOA. **London evening meeting: Gas Turbines and Noise**

On 12 October 2005 Alan Fry gave a presentation on gas turbine noise. Gas turbines are used in a range of applications from pumps in gas supply networks, through electricity generation, to powering helicopters. They are essentially jet engines coupled to the device via an output shaft and gearbox. Owing to the nature of jet engines, in particular the high inlet and outlet gas velocities, they present significant challenges to the engineer seeking acoustical attenuation solutions.

A jet engine, in simplistic terms, draws in air via a series of compressors to combustion chambers where fuel is injected. This explosive mixture on ignition produces high pressure gas which provides thrust as it exits the nozzle at high speed. Turbines propelled by this high velocity gas translate the energy into a rotational force to the attached pump or generator, as well as driving the compressors.

Typical noise levels for a gas turbine at 1 metre are 144dB(A) (intake noise), 131dB(A) (casing radiation) and 133dB(A) (exhaust noise).

In order to control these very high levels of noise, it is necessary to enclose the unit completely. A well-designed single skin steel enclosure can reduce the noise levels to 42dB(A) at 100 metres. A double skin enclosure with a one-to-two metre spacing will reduce levels further, to around 35dB(A).

Carefully designed airflow splitters are required to control inlet noise without compromising air velocities and thus the efficiency of the engine. Inlet noise is typically in the 1kHz range. The control of exhaust noise poses similar problems, but the attenuators must be resistant to 500°C. Exhaust noise tends to be much lower in frequency, typically falling into the 31.5Hz band.

The difficulty for designers is to achieve adequate attenuation in a compact package without excessive cost.

The branch records its grateful thanks to Alan Fry for delivering an expert's perspective on this fascinating topic.

Is The Answer Blowing In The Wind?

Meeting Notice - Wind Farm Noise

Following the immense interest in its meeting on wind farm noise in September 2005, the Institute of Acoustics is organising its second meeting on the subject on Tuesday, 25 April at Stratford upon Avon.

Noise is an increasingly significant issue in the development of renewable energy as more wind farms are proposed closer to housing. Neighbours of these proposed wind farms are often more worried about noise than they need to be, but not always.

Over the years mechanical noise has been much reduced by improved design and better insulation of the nacelle enclosing the mechanism. On the other hand aerodynamic noise of turbines at full power has increased compared with ten years ago but they produce five times the power. To offset the increase of noise, variable speed or two speed turbines can have significantly lower noise levels at low wind speeds when background noise levels are lower and nuisance is most likely to be caused.

Various models are available to predict community noise levels from turbines. There are uncertainties in all these models due to meteorological conditions including wind and temperature gradients and topography.

Even having solved the issue of turbine noise the assessment of impact on the community is difficult to ascertain. It

depends on an accurate assessment of background noise related to wind speed. At present noise from wind farms at sensitive locations is assessed by using a report published in 1996 by the DTI. The working group that wrote it said it should be reviewed in two years and many think that, indeed, a review is overdue.

There are other issues that have been aired in the press in recent years such as vibration and low frequency noise. Is the 'swish' of the turbine blades such a dominant characteristic that it ought to attract a penalty in a noise assessment?

Planning conditions have to be enforceable. Devising conditions that are fair to both developer and neighbours is difficult, not least because turbine noise varies with wind speed and direction and so does background noise.

The meeting will discuss all these subjects and the speakers panel will contain most of the active noise consultants working on wind farm assessments in the UK.

The meeting will be of interest to environmental health officers who have to advise on noise aspects of planning, noise consultants who are advising all parties and developers' and objectors' representatives.

Contact the office at St Albans for more information.



Meeting Report: North-west Branch

Nick Antonio ARUP ACOUSTICS. **Peter Sacre** ACOUSTIC & ENGINEERING CONSULTANTS LTD.

Early in November the North-west Branch hosted a presentation by Max Dixon on the Noise Strategy in London. Max had played a major part in the preparation of London's Ambient Noise Strategy, and has an interest and wealth of knowledge in urban soundscapes. Max and audience faced unusually foul Manchester weather and gridlocked city centre roads in getting to the meeting, but despite this there was a reasonable attendance, although the hoped-for addition of invited local planners did not materialise.

Max provided a clear insight into the numerous ways in which London is looking to the future, in benchmarking, anticipating change and encouraging emergent technologies. His talk covered a wide range of topics including noise mapping, the control of transportation noise, planning, human response and urban soundscape design.

He looked not only to existing situations but also recent changes in transportation including the effects of the congestion charge, moving to more sustainable public transport, and traffic calming. He examined the effect of different road surfaces and the impact on the urban landscape. Absorptive road surfaces are being actively considered in and around London, and Max examined the noise benefits and other effects of these.

The different types of noise barrier were identified, some more graffiti-proof or vandal-proof than others. Smarter traffic calming measures were discussed, including the methods for controlling traffic to avoid unnecessary local increases in noise due to the pressure of 'new' vehicles on other normally-quiet roads, or making it difficult for vehicles to become free-flowing. Max examined the evidence that the drive-by test for motor vehicles might need to be reconsidered for city centre situations, since vehicles could be quieter at high speed under the

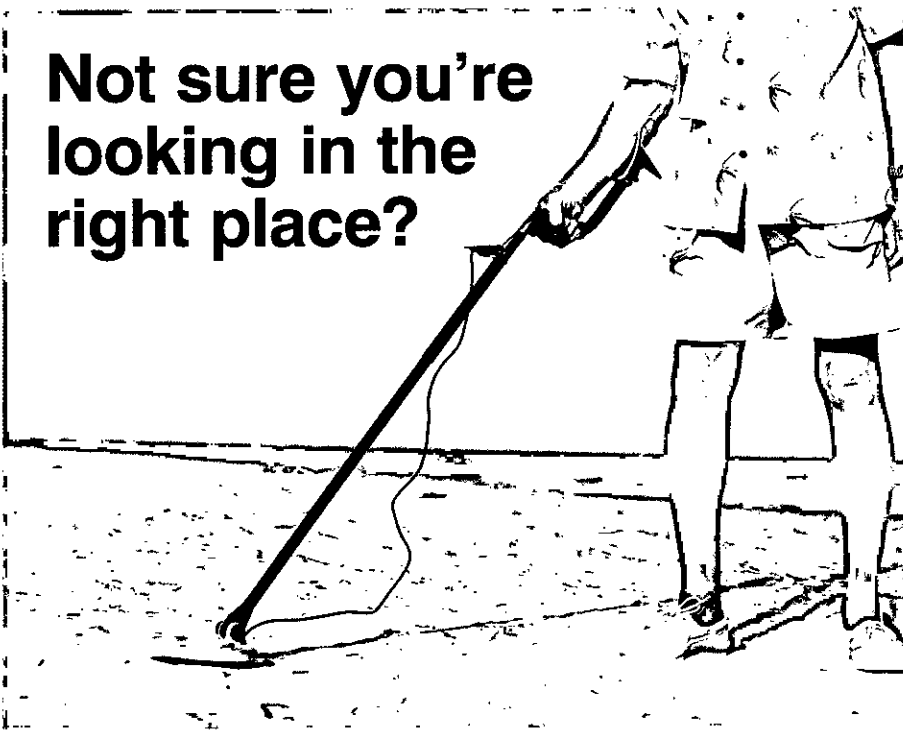
existing test method, but noisier at lower speeds and, hence, emit more noise in city centres.

The second part of Max's talk on developing the soundscape dimension was thought-provoking and forward-looking. He developed the theme of conscious sound design where people can be reconnected to the environment in which they live work and play. He examined convergence and dialogue with urban design, and looked to areas as diverse as the creation of a more humane city, spaces of culture, sonic literacy, human response, sound quality and comfort. Max concluded his talk on the future and a brief examination of priorities. He posed the question whether or not soundscape was a way to integrate acoustic considerations into the planning argument.



Vehicles can be noisier at low speeds in city centres

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Editor's Notes



Ian F Bennett CEng MIOA.

The Spring Conference at Southampton looms, and there is certainly a packed programme to look forward to. If you have not yet booked up, now is the time to speak to Linda.

I have just realised that what with the imminent retirement of our Chief Executive, the coincidental retirement from the Publications Committee of my Associate Editor, John Tyler, and the influx of new faces, I will become the longest-serving member on the Committee, with five years under my belt. However, I would like to take the opportunity to thank both those gentlemen, on a personal level, for their valuable support and assistance during my occupation of the editor's chair. With thirty issues of the Bulletin completed so far, I generally feel that I know what I'm doing at last, but there can still be unforeseen circumstances and minor emergencies to deal with. It has always been a comfort to know that I can pick up the phone to John or Roy and say 'Help!!!' I'm sure Kevin Macan-Lind will be well briefed by his predecessor about what to do when Bennett 'goes off on one', but in all seriousness, I look forward to working with the new Chief Executive!

I'm delighted to report that the reaction of members to the revamped Bulletin has been entirely positive. The Publications Committee has now helped me to sort out some small niggles with the layout and format, but please feel free to let me have your thoughts — just drop an e-mail to ian@acia-acoustics.co.uk and I promise not to file it under 'spam'.

As always, I am happy to consider any written material that may be of interest to members, and please feel free to talk to me about possible content. We can usually strike a sensible balance between content and style, so do not worry if your talents do not include too much in the way of creating writing. With our smart new format, attractive colour photos always increase the appeal. Latest copy date for the May/June issue is 13 April: it's a Thursday because I for one will not be working over the Easter holidays. Please let me have any technical contributions, branch meeting reports, or other items for publication by then (at the latest, or I'll set Judy on you...).

Ian Bennett

Noise & Planning

Bob Peters FIOA. London branch one-day meeting

A capacity audience of about 90 delegates attended the IOA London Branch's one-day meeting on Noise and Planning on 7 December 2005 to hear a total of six presentations, leading to an hour-long discussion at the end of the meeting.

The first paper, prepared by **Colin Grimwood**, Paul Freeborn and Stephen Turner of Casella Stanger, and presented by Colin, outlined the process currently in progress to review the existing PPG24. Planning Policy Statement 24, to be published in 2006 to replace it, will be in two parts: a fairly short policy document, and a more expansive Companion Guide.

The review process is being organised by two different government departments: Defra has responsibility for environmental policy, and ODPM has responsibility for planning. The Institute is grateful to both Departments for allowing Colin to outline some of the likely contents of the new PPS24, although he did emphasise that no final decisions on content had yet been made, and that until the new policy was issued in final form PPG24 remained operative.

The new PPS24 will need to encourage a more flexible approach to noise and planning than does PPG24, in order to meet the requirements of government policy on sustainable development (PPS1), Planning and Pollution Control (PPS23), and Ambient Noise and Neighbourhood Noise Strategy, as well as the EC Environmental Noise Directive. With regard to new residential development, the issues under consideration include the replacement of the present four Noise Exposure Categories (NECs) with three new Noise Exposure Bands (NEBs), the introduction of target maximum internal noise levels as an underpinning bottom line (rather than through the Building Regulations which was considered in the early stages of the present revised Approved Document E), and the introduction of target external noise levels to protect gardens and community space.

In the second presentation **Tim Waters-Fuller** of Napier University outlined the results of a Defra-sponsored research project on sound transmission through open and closed windows. Tim provided a useful review of previous work on the subject and he described a comprehensive series of tests carried out at Heriot-Watt University between a simulated domestic test room connected via the test window to an anechoic room containing a loudspeaker sound source. The test programme included seven window unit samples with twelve distinct opening styles, seven source locations, 750 measurements and 6750 measurement spectra. For a constant open area condition a variation of 10dB in attenuation was measured for different opening styles, with a small top opening light giving the best performance and a vertical sliding sash providing the lowest sound attenuation. The effects of variations in other relevant parameters on the sound insulation (D_w value) were investigated, including angle of incidence (5dB), amount of room

absorption (7dB), and spatial position within the room (9dB). Measurements with trickle vents showed that the inclusion of a slot ventilator within the window frame, even in the closed position, significantly affects the sound insulation of the window, and that in the open position the sound insulation is only marginally better than the open untreated aperture condition. The publication of the full report and its database of information will be eagerly awaited.

The next paper presented by **Stephen Turner** reviewed the progress of the draft IOA/IEMA Code of Practice on Noise Impact Assessment which, after more than 10 years in development, might finally be published in 2006. In the review process much emphasis has been directed at Chapter 7 of the draft, on Noise Assessment, which deals with the problem of making judgements based on changes to basic noise (eg in parameters such as L_{eq}) resulting from a development. Stephen reminded us of the several factors that should be taken into account when making this judgement and gave examples of how consideration of each factor might significantly affect the judgement. The factors are the sample or averaging time period, the time of day, the nature of the noise source, the frequency of its occurrence, its spectral characteristics and its absolute level. Stephen turned our attention to three crucial paragraphs in the draft, 7.65, 7.66 and 7.67, leading to a discussion of semantic scales - tables showing how different ranges of changes in noise level (eg 0 to 3 dB, 5 to 10 dB etc) might be assigned a verbal description of the impact (eg slight impact, substantial impact, etc). Paragraph 7.66 contains an example of such a scale and paragraphs 7.65 and 7.67 emphasise that the example cannot and should not apply to all situations. The review process has shown that despite this warning the example semantic scale of 7.66 was being set in 'tablets of stone' - in other words, the guidance was not being used correctly.

Nevertheless, despite these difficulties, it was felt that there was still a need for a semantic scale, but the use of such a scale should be adapted to and justified for each situation individually. Simply because a semantic scale has been used for one situation it does not mean that it will be appropriate elsewhere. A variety of different semantic scales which have been tried were described. A way forward being considered for inclusion in the final version of the guides will be the suggestion that the descriptions of changes in levels should relate to the perception of the change (not noticeable, noticeable), its consequence (intrusive, disruptive, harmful) and its significance (significant, not significant). The draft document is rather long, with the earlier chapters covering much introductory material (such as basic acoustic terminology and the decibel scale) of interest to the non-specialist in acoustics, as well as key later chapters. Chapter 7 contains the key advice and information of most interest to specialists. The final version will be published in two parts: a summary document containing the

advice needed by the specialist, and the full document. It is hoped that these will be available in 2006. The opinion of the meeting was that the publication of the guide will be of great value in itself and will complement the new PPS24.

The first of three presentations reviewing aspects of the existing PPG24 was a joint contribution by **Dani Fiumicelli** of Capita Symonds and **Kieran Gayler** of SRL, presented by Dani. This dealt in more detail with one of the issues highlighted in the opening presentation: the conflicts between PPG24 and other planning guidance. Dani provided a very detailed and useful review of all the relevant advice given in PPS1 (Sustainable development), PPG3 (Housing), and PPS6 (Planning and Town Centres) and demonstrated where the advice was in conflict with the approach of PPG24. In order to resolve these conflicts he suggested that a more flexible approach was needed. PPS24 should re-define the present NECs and place less emphasis on physical separation in favour of a more varied hierarchy of other possible mitigation measures, in which façades with high sound insulation should only be accepted where orientation, layout and screening do not provide sufficient mitigation in order to achieve acceptable acoustic conditions.

The second of these presentations, also given by Dani Fiumicelli, concentrated on an aspect often considered to be under-emphasised in PPG24: how to assess the impact of new noise sources on existing noise sensitive premises. Once again Dani thoroughly reviewed all the possible approaches, making the distinction between those based on absolute noise criteria (fixed noise limits), and those based on comparisons with existing ambient

or background noise levels. He illustrated this review with a detailed case study, concluding that different approaches to impact assessment were appropriate depending upon local conditions, and that the most appropriate assessment method must be selected in each individual case. This 'horses for courses' approach chimed well with the earlier conclusions from Stephen Turner.

The third contribution on PPG24-related issues, and the final paper of the day, was presented by **Chris Middleton** and **Andrew Lockwood** of Acoustic Design Technology and entitled *Controlling External Noise Intrusion - Expectations and Reality*. Their paper dealt with the specification of suitable noise mitigation measures, particularly glazing types, to deal with the ingress of external noise into premises. The authors called for a more uniform and realistic approach to the setting of internal noise design criteria by local authority planning departments, taking into account local conditions rather than always demanding the lowest possible internal noise levels irrespective of circumstances and practicalities. They gave several examples illustrating their point.

They recommended a reasonable basic standard for internal noise levels with the achievement of even lower internal levels of external noise intrusion being rewarded by some form of 'star rating' which might be incorporated into a building performance system such as the BREEAM. Problems associated with the implementation of current PPG24 guidance on L_{Amax} values at night were described and it was suggested that it might be better to use a percentile level such as L_{A01}

over a suitable time period. A more flexible approach to design criteria for outdoor amenity spaces was also recommended, with the existing PPG24 guidance of 55dB L_{Aeq} often being considered unreasonable and unattainable. They also recommended clarification in the way PPG24 specifies the combination of hourly levels to determine the L_{Aeq} value over the 16-hour daytime and 8-hour night-time periods.

The current guidance given in Annex 6 about the specification of acoustic performance of glazing systems was criticised for being too simplistic and for failing to take into account spectral (octave band) differences in external noise (which can also vary significantly over a daytime or night-time period) and in glazing sound insulation. These authors also highlighted the need for much clearer specification and research into the performance of whole-house ventilation systems.

The meeting concluded with an hour-long discussion in which all the speakers participated. The questions dealt with a wide variety of issues including industrial noise, BS.4142 and noise nuisance, inaudibility as a planning criterion, amenity areas (balconies, 'winter gardens' and quiet façades), the methodology for internal noise assessments, the new licensing regime, sound level meter standards, and possible future research topics.

Most of the delegates seemed to be very happy with the arrangements for the meeting provided by the Royal Society. The mince pies were excellent!

Copies of the Proceedings are available on CD from the Institute office.



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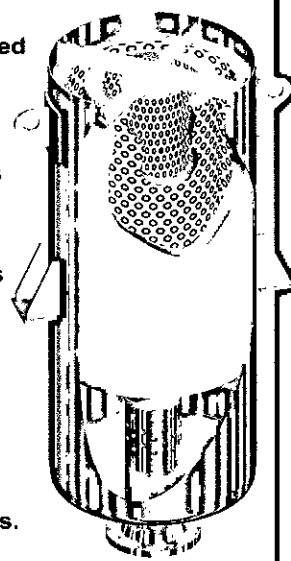
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Achieving Great Concert Sound

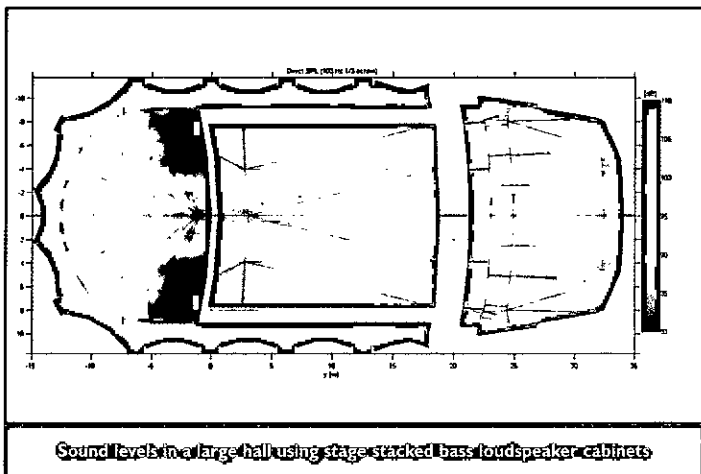
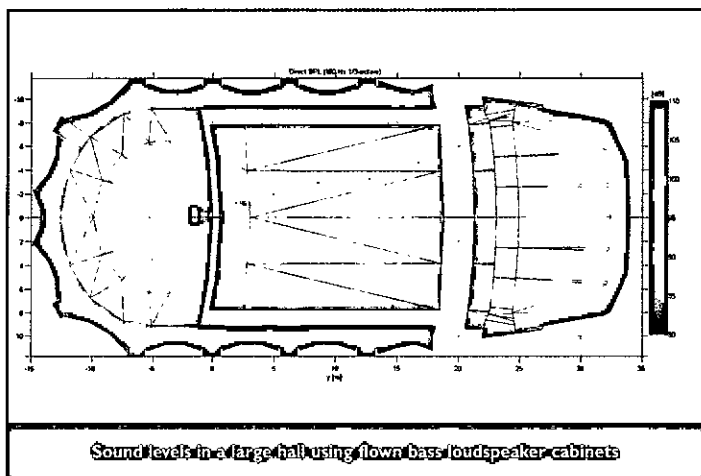
Sam Wise CEng MIOA MIEE MAES. Lessons from the trenches

Introduction

This article examines some of the many factors that conspire either to produce or prevent great concert sound for amplified events in music halls from about 800 seats to 2500 seats. Some stages in the development of music and music halls over the last 100 years are light-heartedly reviewed to try to develop a brief for the Music Hall. What should this brief be?

We shall focus on three main groups of factors that contribute to success or failure in achieving the brief - perhaps for the time being the last frontiers to be crossed to make great concert sound possible. These are:

- mid and high frequency diffusion versus more specular reflections from flatter room surfaces
- acoustical and psychoacoustical issues affecting low frequencies, and
- the struggle to find common ground and achieve real cooperation between the stakeholders in the music production itself.



There are even, of course, different views on what constitutes Great Concert Sound, depending upon the music type and the audience member's expectations. If great concert sound is the accurate conveyance of the content of the music itself, and the quality and sound detail of the instruments and voices, then it is only accomplished when all elements come together, either through strategy or accident. Is this ideal contradictory to a feeling of energy and excitement? Does it set itself against the live music experience of room and audience? The goal of this article is to improve the protagonist's awareness of some of the issues that might be involved, in the hope that increased cooperation and sharing of knowledge might lead to more consistent and enjoyable results.

The author is himself hungry to learn more and achieve more and is

convinced that those involved must respect one another and share their way of undertaking the work. We must seek a common language, or at least struggle to find agreed interpretations that permit a common understanding of what is required for success. The goal then is to discipline the problems, expose the strengths and leave more events having achieved the thrill of musical satisfaction.

Halls For Music

The background

Probably since music began to be played, there have been all kinds of musical styles. Somewhere in the history of music, rich, wealthy, powerful and important people set apart some styles of music and built rooms for them. Other musical genres continued unabated in ad hoc venues of all sorts, apparently without loss of pleasure for either the players or their audiences. However, as democratisation and the extension of wealth spread power more widely, and the people's money began to be used to erect buildings for music, these buildings were required to support more than just elitist styles: they had to include traditional and popular music as well. In parallel with these developments, the rooms got bigger, orchestras and bands got larger and their instruments grew more powerful. The pitch of music rose over two centuries to increase musical impact. Instrument makers did well in the business of either modifying or replacing the instruments of earlier generations with louder models. New instruments, with more carrying power - such as the saxophone - were invented, all to serve larger and more demanding audiences. Eventually some sense prevailed and at least the rise in musical pitch was largely arrested - though it was not internationally agreed until the 1950s. Even today, it is inching upward again.

Though voice teachers managed to some extent to help lift the human voice against the rising tide of instrumental vigour, it nonetheless became more difficult for singers to keep up against the onslaught. Acousticians were invented and entered the fray, using their mixture of science, craft and art to remix the sound in the room somehow, to favour the weaker instruments - such as the voice. Somewhere along the way, the microphone, mixer, amplifier and loudspeaker were created, making it possible particularly for vocalists to entertain more listeners simultaneously - thus increasing their status and income. Microphones leaked over the border towards the musical instruments. Those prone to unwanted feedback had their vibrating bodies deleted and their musical vibrations collected before even entering the air. Over time the amplifiers and loudspeakers became more powerful, enabling the music not only to tickle the ears and make the feet jump, but indeed to vibrate parts of the body directly. The ultimate goal here, considering the typical age of the listeners, takes little imagining. A little later, even the listener's clothing began to flap.

But this is a tale of music halls. Music has been called the 'opiate of the people'. To provide this opiate in a democratically acceptable way, all brands are required to be distributed fairly. Let the people decide! Since most towns of small and average size cannot afford more than one specialised music hall, the hall itself had to be a venue for all types of music. Is one musical type superior to others? As a player myself and a person unable to stay in a box, I would have to conclude that no music is superior to any other. But there are certainly better concerts and worse, whatever the musical type.

Meanwhile in this stream of development, the unamplified musical group failed to develop further in loudness or size. Some players wished to retain control of the destiny of their sound and generate it directly by their own efforts. Others in the team had perhaps less rhythmical prowess and wished to follow a stick to keep time rather than take note of abdominal vibrations. Interestingly, there were now two sets of rich and powerful people, each supporting different musical styles. Those who won their

continued on page 18

Achieving Great Concert Sound - continued from page 17

money by commerce and sometimes by dubious practices frequently became benefactors for the individuals wishing to control their own sound. These continue to contribute large amounts of money and effort to help ensure that 'classical' music is provided with new homes. Most of those who won their money by playing to larger audiences kept it, and promoted more events to increase its value. And many eventually came back to the smaller venues where they originated as their ability to draw large audiences began to wane, or in the desire for more intimacy or "back to the music" of their origins. Thank goodness for that, since those audiences of old friends often provided the income necessary to stabilise the hall financially.

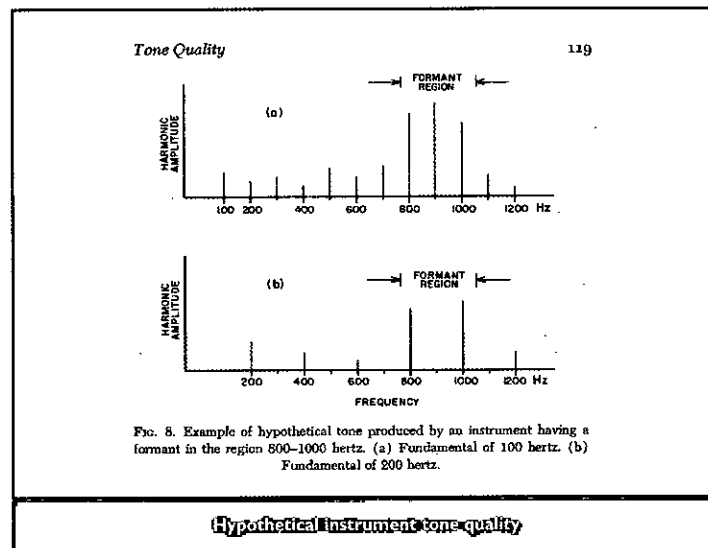
The role of the acoustician continued to develop, aided by increasing demands for fresh air, transportation vehicles and buildings where listeners could choose between amplified or unamplified performances in two different rooms on the same night. Beer continues to flow in venues, though the silent strength of the barman's arm has waned as county life has diminished. As a result, more and more noisy pumps are needed to replace lost muscle, but must be mounted to keep background noise under control. Aha, another job for the acoustic consultant!

But, the whole truth is not yet out. The unamplified musicians required more assistance from the acoustician than just helping to keep the room quiet and to get a balance between them. Somehow the room itself was a part of the musician's individual and corporate sound quality - its timbre and excitement. So, yet another art emerged in the acoustician's world - the means of keeping the room's assistance going as rooms got bigger. Ways were needed to keep the musician's limited power intact. Shapes, locations, constructions and distances of surfaces were found to need detailing. Over in the amplified music world, just the opposite was the case. Yes, fresh air and beer at the right temperatures were desirable features, as was the ability to keep out the awful sound of the symphony orchestra during a rock event. But, other than those requirements, a room without walls would be ideal - for the same reflections that create delight for the orchestral listener could cause saw blades to cut through the heads of rock audiences. Ah, but there is an advantage to those reflective walls - a saving on amplifiers and loudspeakers while still permitting the audience to 'feel the force'. So emerged a new and special type of rock music hall. Numerous grand old cinemas, having been defeated to the point of death by television, were stripped of all internal acoustical treatment, most of the seats were removed, and then large sound systems were installed. Power to the people! Often, it has to be said, not much else to the people, but power certainly. Pelvic vibrations were optimised, nights out became more fully satisfied, money and favours exchanged hands. Most, if not all, were happy with the transactions achieved. For this highly satisfactory musical experience, acousticians had only one role - that of preventing neighbours from achieving the same satisfaction at home as those who paid to attend the event. The music should not be experienced for free!

The brief

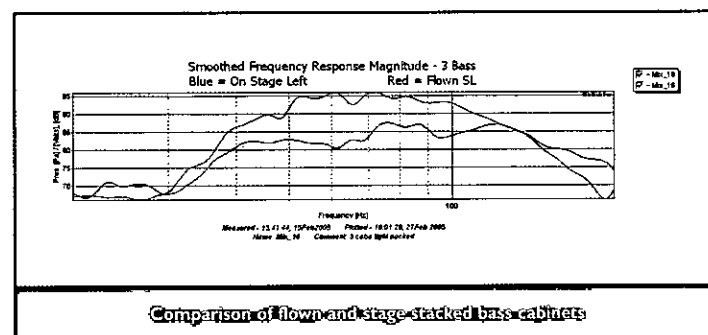
So where is the Multi-purpose Music Hall now? The only specialist hall in town (the old cinema) caters for power rock events by big-name groups. Our music hall is a hall for all other sorts of music. The greats of the 'classical' world can be expected to use it with many sizes of ensemble. So can the best of niche-market amplified groups such as roots, traditional, folk and contemporary mixed music events. Jazz players might play there now that the once-preferred smoky haunts are being freed from their familiar visual and respiratory haze. Dancers of the more esoteric styles will dance upon its stage. Three tenors (but not the ones you thought) will deliver opera without the exhaustion of acting at the same time. Also attracted will be up-and-coming local rock bands as yet unable to command a larger venue. And finally, we can expect names famous to middle-aged popular music lovers, whose stars are fading, even though their music might be better than ever.

Probably the majority of musicians and a significant part of their audiences can be numbered among those seeking nuance as much as energy. Their energy is delivered through stagemanship, detail, contrasting sound levels, beautiful chords, rhythmic feel and amazing timbral subtlety rather than sheer sound power. The ability to create and convey a convincing and



Instrument	Formant (1)	Formant (2)
Flute	800	
Oboe	1400	3000
Cor Anglais	930	2300
Clarinet	1500-1700	3700-4300
Bassoon	440-500	1220-1280
Trumpet	1200-1400	2500
Trombone	600-800	
Tuba	200-400	
French Horn	400-500	

Table of formant frequencies, Hz for woodwind and brass instruments



heartfelt musical detail and deliver it to the listener is paramount. Players are encouraged to play and listeners to really listen.

The delivery

If we accept the premise that all music is equal, then a lot of wormy cans are opened during both the design of the hall and in the interaction between those putting on the events themselves. The rest of this article poses some questions, cites some ideas for development or disposal, and generally attempts to let the worms out of the can so that we can try to induce them to behave as we intend, rather than vice versa.

Whether your role is that of musician, architect, sound designer, acoustician, event manager, hire company director, house or stage monitor mix engineer, or anyone else involved in this process from beginning to end, you have either a positive or negative role to play in delivering Great Concert Sound. Let us talk together and see what we can achieve that will help bring in our audiences, so that our preferred music can be kept live and alive.

continued on page 20

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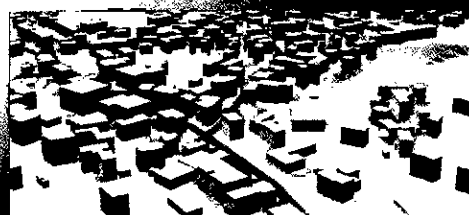
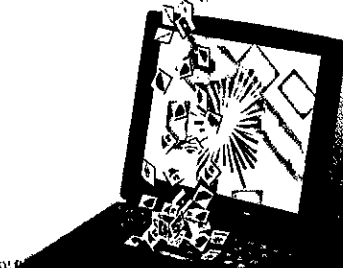
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Achieving Great Concert Sound - continued from page 18

Getting The Sound Across:

Physics, Acoustics & Psychoacoustics

There are countless books, papers and magazine articles covering these topics. It is not possible in this article to address even a fraction of the issues. We will concentrate on what we see as the last frontiers in this generation - the steps for exploration toward the goal of achieving great concert sound. This section assumes that the client will require a 'world class concert hall'. This usually implies that the room finishes and geometry of the hall will be designed to deliver it, rather than adopting an electro-acoustically based solution. We expect this to remain the case for most halls for some time to come, though for clients in smaller towns and with proportionally smaller budgets, electronics will be the right solution from time to time. For present purposes we assume the 'natural world class concert hall' as the starting point.

Reverberation, absorption, and reflection control

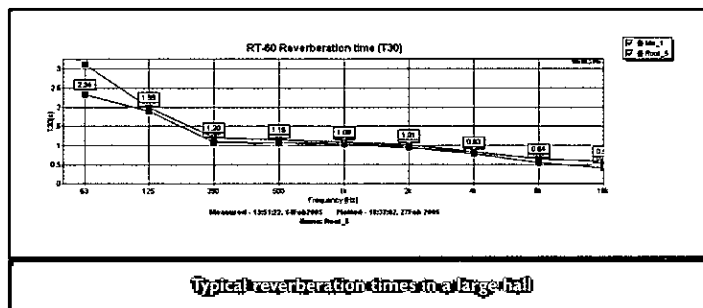
A requirement for our hall will be a narrow range of fairly lively reverberation criteria, probably with a rising RT in the lowest octaves and typically around 1.8 to 2.0 seconds mid-band. Walls, balcony fronts and other surfaces will be arranged to return early reflections from the musicians on stage to each other and to the audience. Smooth surfaces will sometimes suffice. Over the last 10 to 15 years many architects have preferred very simple visual surfaces with little modulation on them. On the other hand, most acoustically successful halls included a great deal of architectural detail at all physical scales. These include statues, highly ornate decoration, wall mouldings and architraves etc to provide substantial diffusion within the hall.

Recent experiences both in smoother and more articulated halls indicate that diffusion greatly improves the amplified sound experience, softening the edges of the sound, reducing comb-filter effects and allowing more comfort at high sound levels. But there have been some questions as to whether the room character has been diminished, and the level of early reflections reduced, taking something away from the experience of unamplified performances. Should we now look in more detail at which surfaces particularly affect the room when it is delivering each type of musical event, to see if we can optimise it more precisely for both? Can we make diffusion variable, as we do mid-range reverberation levels? In most recent halls, there is indeed variable absorption, accomplished mostly by exposing absorptive materials at the will of the concert manager. This does a good job over a range of frequencies and when combined with diffusion seems to produce a very nice hall for amplified music. But, at the lowest frequencies, say below 150Hz, there is rarely much diffusion or absorption. The room remains the same for all music types. We will examine this in more detail below, but should we be investigating means to produce low frequency diffusion in an architecturally acceptable and cost effective manner? Should we be trying to introduce variability in reverberation at the lowest frequencies?

Upward masking and perception of timbral and rhythmic detail

Having had the benefit on occasion of sitting at the 'house mix' position during indoor festival events, it became very clear through the day that the sound system in use ranged in quality from exceptionally good to quite poor as the performing group and the house and stage mix engineers changed. Bear in mind that the sound system itself, and the available processing for it, were not changed: adjustments were only made by the mix engineer himself (and settings were sometimes sneakily changed back by the sound rental company between performances). The difference in quality to my ears was clear at all frequencies, but as a bass player, the effect was even more pronounced for lower frequency instruments.

One particular system used a cardioid bass configuration, and it was established by listening on stage that this did indeed develop much less bass at the musician's position on stage than would a conventional system. It had an optional infra-sub that could be "pointed" towards the audience. Further bass and low bass cabinets were available for optional use by the musicians under the control of the stage monitor mix engineer. In one band's performance, an amplified double bass delivered a stunningly detailed sound, full of personality and lots of notes (when needed). You



Typical reverberation times in a large hall

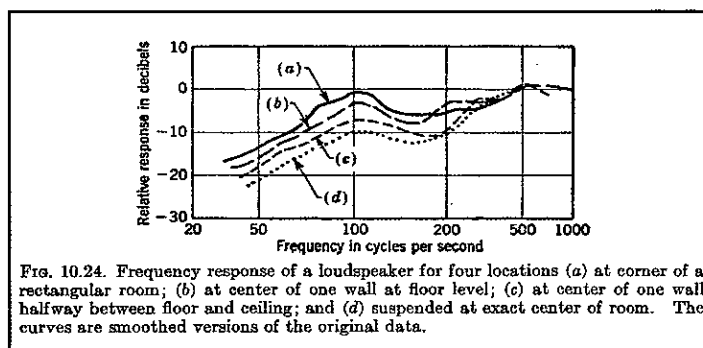


FIG. 10.24. Frequency response of a loudspeaker for four locations (a) at corner of a rectangular room; (b) at center of one wall at floor level; (c) at center of one wall halfway between floor and ceiling; and (d) suspended at exact center of room. The curves are smoothed versions of the original data.

could have gone into a music shop with 20 basses, tried them all, and found this particular instrument by identifying its particular 'sound' from what was heard at the mix position through the sound system.

Two bands later, another player using an electric bass played a million notes and was obviously hearing (or pretending to hear) this on stage. He was in ecstasy. In the audience, the sound of wobbly jelly was heard and that even seemed to obscure what little could be felt from the kick drum. There was almost no rhythm, little pitch and practically no timbral quality. Note was taken that the rack of third-octave graphics had changed from slight corrections to a sea of needles. Sound levels were also higher, but not startlingly so. Had there been only one band to listen to on this sound system, one would have concluded that it was not worth the wood used to make the cabinets. The sound the first band produced on the same systems would have you take it home to use as hi-fi.

Following this, and arising from other experiences comparing the speech intelligibility of male and female voices, some study was made and some questions asked. These are still ongoing for investigation.

- It seems that there is serious upward masking from lower frequencies, with an effect more pronounced than at mid- and high-frequencies. This is not really apparent in the STI matrix (but at least masking is considered in the most recent proposals). This implies that control of low frequency reverberation would have a positive effect on amplified concert sound, with similar benefits as mid-frequency diffusion. Finally, we should be trying to achieve direct sound spectra and sound power spectra that are the same, so that reverberation energy spectra match, rather than exceed, those of direct sound across all frequencies. In other words, we need a truly 'constant Q' loudspeaker. Contemporary line array systems with 'cardioid' bass are coming closer to achieving that.
- Masking seems to worsen with rising amplitude. We know this is true, yet take little notice of it when trying to assess clarity through measurement or achieve it through design. There is work dating from the 1950s showing what happens. My ears tell me that an excess of the lowest frequencies cause more masking than mid-frequency sounds do. Is this right? How can we achieve better sound and still maintain 'impact' at lower frequencies? Can we make an abdomen bouncing / trouser-flapping transient wave that tracks the kick drum, while eliminating most of the harmonics that would mask the aural experience of timbre?
- Musical timbre can be lost to equalisation. Study of musical acoustics reveals that it is not only the nature of the overtone series, but also band-pass shaped 'formats' that define the character of a family of instruments and of an individual instrument (or singer). Use of graphic equalisers almost always produces serious ripples and dips in the frequency response that can counteract these formats and smother the

real sound of the source being amplified. This is a good reason for examining the user interface on parametric equalisers so that we can achieve the simplicity of control of the graphic together with the smooth response of the parametric.

- More work is needed on balancing what amplified musicians on stage need to hear in order to play together and well, compared to the amount of sound spilled from stage into the audience and reverberant sound field. In-ear monitors help, but frequently very loud sound sources remain active on stage that are harmful to the audience experience. This is particularly true of the bass. The result is often loud, louder, loudest – with no winners anywhere in the room. Getting the musicians more involved in this issue is vital to progress.
- Finally, the importance of the sound at the house mix position cannot be underestimated. The man (or woman) who is genuinely trying to pull together a cohesive mix of sometimes warring forces from the band, in an often difficult and unknown (to him) room, faces a real challenge. What more can be done to give a good working environment to this key person, while also ensuring that the audience sound is also well catered for? It isn't easy. Putting sub-woofers on stage produces acoustic gains from hemispherical radiation, compared to a flown bass. The necessarily split bass also produces a nice fat lobe down the middle of the room that produces more impact at the mix position. The result on stage and mix position can be physically exciting. But, if the upward masking from bass really is a serious effect, the result is much higher monitoring levels on stage, compromising the role of the house mix engineer who starts with too much sound in the house before a fader is even opened. There is a lot of practical evidence for this.

Summary

In summary, it seems clear that some things are improving, but slowly. Louder is easier than better. There is a lot of evidence that musical detail is lost in the process. There are technological developments in both room and sound system design that will help. More could be done if more money was available, particularly in controlling the bass character of the room. But, education, teamwork, cross-discipline communications and good research in perception and psycho-acoustics could result in many more Great Concert Sound events over the next 20 years than improvements in sound technology or room design alone can bring.

Acknowledgements

I am grateful to the enormous number of people who have influenced my life experience and knowledge so far. There is still a lot to learn and so few years remain. Don Davis and Pat Brown (Syn-Aud-Con), Glenn Leembruggen in Sydney, and colleagues Kurt Graffy in San Francisco and Rob Harris in Winchester get special mention.

Thanks also to industry managers, technicians, musicians and mix engineers who have dared to try to talk about what they do, what they want and try to explain why. Lurking in here is the important information needed to achieve Great Concert Sound together. Others please join us, we need to keep the understanding and improvements going.

Many, many books have influenced these ideas. When some of the issues are resolved further, it will be appropriate to give more detailed credit. Thanks to all who bother to share what they know, so that all of our work is improved. An idea may be imperfect, or only partially developed. Many ideas are. But frequently they lead to insight and progress when discussed with others.

Finally, my clients, both exciting and exasperating, are the reason why Great Concert Sound will ever be possible. If you did not build buildings and run them, where would music be? Thank you, thank you, thank you.

Sam Wise CEng MIOA MIEE MAES is leader of the Arup venue consultancy team



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Cone Drivers

Bruce Howze. Some recent work on cones, suspensions and cooling

Loudspeakers generate a considerable amount of heat when operated at high power levels. Cooling a loudspeaker will increase its performance and power capacity, and probably also its useful lifespan. Three methods for loudspeaker cooling are discussed, along with test results illustrating the thermal performance of each method.

The cone and suspensions of a loudspeaker have a significant effect on both acoustical and mechanical performance. Some recent development work on cone and suspension shape and on carbon fiber cone reinforcement is presented. Response and vacuum impedance test results are included to show the effect of the cone reinforcements.

The first portion of this article deals with loudspeaker cooling. It is well known that loudspeakers, especially woofers, are quite inefficient converters of energy. The great majority of the power applied to a woofer becomes heat, not sound. The heat generated in a woofer operating at high power levels has several detrimental consequences, the most noticeable of which is an increase in the DC resistance of the voice coil wire. As the voice coil temperature increases, so does the resistance of the coil wire. This increased resistance causes the woofer to actually become less efficient, because a greater portion of its total impedance is now resistance. The resistance portion of the impedance creates no sound, only heat. In operation, the woofer will appear to be suffering an even greater loss of efficiency, because the increased impedance also causes the woofer to draw less power from its amplifier. The hot voice coil is receiving less power for a given voltage, and it is less efficient at converting that power into acoustical output. The total of this output reduction due to heating is commonly referred to as "power compression".

Power compression can reach several dB, probably as high as 6dB in low sensitivity subwoofers. Many woofers achieve very high power ratings primarily by having the ability to withstand very high voice coil temperatures, but their sensitivity is significantly reduced by power compression at those power levels.

High voice coil temperatures also have other undesirable effects on performance. Most materials, particularly adhesives and insulation, suffer some diminished properties under extremes of heat. Thermal expansion can result in warping and misalignment of components. A voice coil that has increased diameter owing to thermal expansion will often no longer be round, and certainly has a greater possibility of rubbing against the top plate of its magnet structure.

I think it is clear that any amount of cooling that can be applied to a woofer will be beneficial. One very commonly used cooling method is venting of the pole piece of the magnet structure. The motion of the cone assembly will pump air in and out of the cavity under the dust cap. This air passing through the pole vent helps to cool the magnet structure. A few years ago the author attempted to improve on this cooling method by introducing an airflow director (US patent 6,390,231) into the air path. Figure 1 shows a conventional woofer motor with a vented pole piece, and also a similar motor with the addition of an airflow director. The voice coil former in the airflow motor is aluminum, and is taller than normal. This extended aluminum former becomes a cooling fin for the voice coil, and the airflow director causes the air to pass in close proximity to the former. The intention is that directing the air to flow over the hot aluminum former will remove more heat from the voice coil than simply allowing the pumped air to take its natural path in and out of the cavity.

To test the theory two identical 12-inch woofers, one with its airflow director removed, were used. The woofers were moderate power units with 2-inch voice coils. A thermocouple was attached to the outer edge of the top plate on each woofer. The woofers were installed in vented enclosures and run in parallel with a 40 to 400 Hz music signal of approximately 100 watts for several hours. The results are shown in Figure 2. The woofer with the airflow director did stay slightly cooler for the duration of the test. Figure 3 is a photo of an airflow director: the material is nylon.

Active cooling can be combined with directed airflow for increased cooling capacity. To test this a 120mm fan was added to the back of the woofer with the airflow director. The fan was driven by the audio signal through a control circuit (US patent 6,837,333). Figure 4 shows the result in a test of similar duration to the first one. Clearly the fan provided a good increase in cooling,

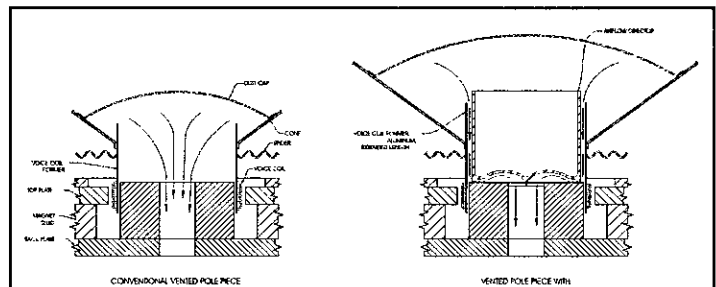


Figure 1

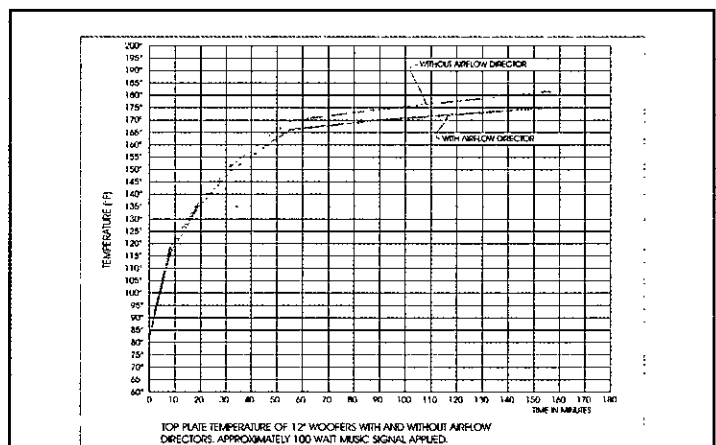


Figure 2

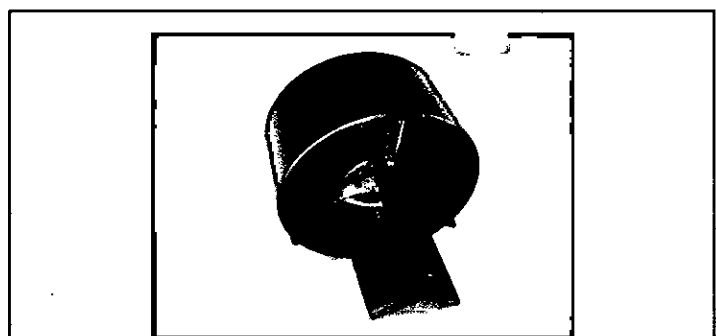


Figure 3

lowering the final temperature by almost 20°C. Figure 5 shows the woofer with its fan.

The fan blew air over the magnet structure and provided circulation of the air inside the speaker enclosure. Being a low pressure device, it could not actually blow air through the woofer motor itself. The next test was performed with a centrifugal blower connected to the pole vent by a tube. Vent holes were cut in the cone just below the dust cap to provide an exit for the air. Figure 6 shows the arrangement, and Figure 7 shows the woofer with its tube. The blower was powered by the audio signal through a control circuit.

The results of this third test were a bit more impressive. After almost three hours the control woofer was nearly at 80°C while the woofer with airflow director and blower had not managed to reach 40°C. Figure 8 shows the test results, and Figure 9 is a photograph of the test setup. As is evident for the photograph, the blower was located outside of the cabinet, so it was causing air

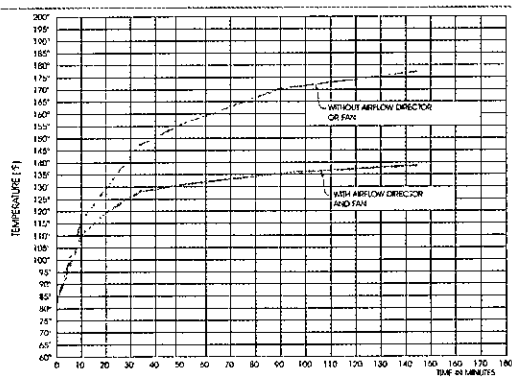


Figure 4



Figure 5

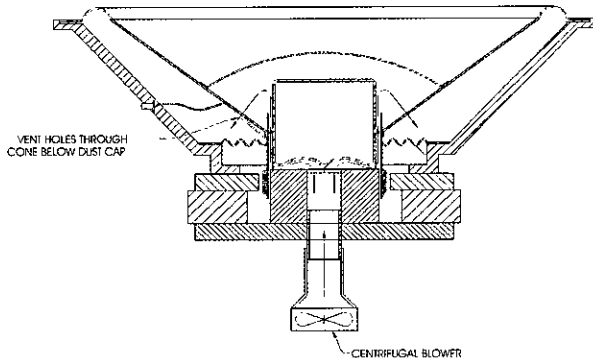


Figure 6

to flow through the woofer and circulating air through the cabinet itself.

These tests show some of the results that can be obtained with passive and active cooling methods. It is clearly possible to significantly cool a woofer motor by applying sufficient airflow. If heating can be removed as the primary cause of woofer failure, the next limitation will usually be mechanical. If the woofer cannot burn itself up, one can increase the power until it just shakes itself apart. Good mechanical design can make that limitation be fairly high.

We may now turn to some recent work on woofer cones and suspensions, in which the goal was to improve cone strength and stiffness while keeping cone mass as low as possible.

Community Light and Sound manufactures some carbon fibre diaphragms. In the development work on one of those diaphragms (about 12 years ago) a significant increase was noted in diaphragm stiffness caused by placing a ring of unidirectional carbon fiber around the outer edge of a dome. The diaphragm, a 90mm diameter dome, had a major break-up mode around 8kHz. With the

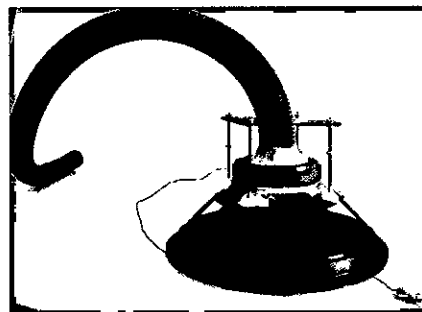


Figure 7

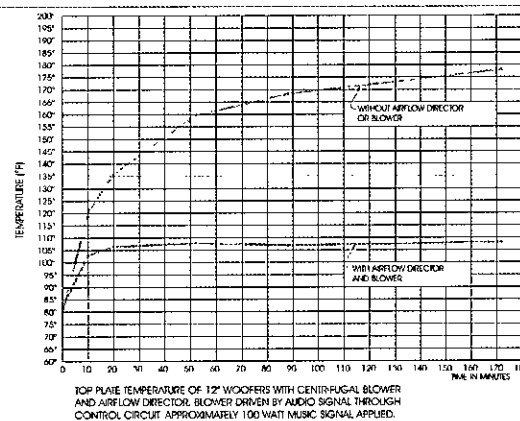


Figure 8

addition of the carbon ring, the mode moved up above 11kHz, and its magnitude was reduced. Figure 10 shows response and impedance of diaphragms with and without carbon rings in an EM282 driver. As it turned out, the break-up at 8kHz actually contributed usable response to the driver, so the carbon ring was not used, although the stiffness that it imparted to the diaphragm was impressive.

When considering possible methods to improve woofer cones the results obtained with the carbon ring and dome were brought to mind, and the same thing was tried on a cone. Some promising results using standard cones led to a cone shape designed specifically for this sort of reinforcement. The design of the new cone is shown in Figure 11. The cone is deep, and the wall fairly heavily curved. At the outer edge there is small flange approximately at a right angle to the cone body. A ring of unidirectional carbon fibre roving is laminated into the groove formed on the back side of the cone by this flange. Carbon rings could be added to other diameters on the cone as well, although the major benefit seems to result from the primary ring at the outer edge.

Figure 12 shows the new cone in a complete driver (US patent application 60/672,378). In considering the design for this type of cone, it seemed that it would be beneficial to make the piston diameter as large as possible within the confines of standard frame sizes. A large cone diameter naturally leads to a very narrow surround, as shown in Figure 12. The plan for the surround was to enable long cone excursions without putting undue forces on the cone edge. It was intended to put most of the spring force in the spider, leaving the surround primarily to provide radial location and an air seal.

Figure 13 shows a comparison between the cone diameter and surround shape of a 12-inch carbon ring cone and that of a conventional 12-inch cone. The outside diameter of the conventional cone is 225mm, and that of the carbon ring cone is 260mm, providing a nice increase in piston area. The surround of the conventional cone is relatively shallow, while the new surround is fairly deep. It is the depth of the surround on the carbon ring cone that enables long excursions from a narrow surround.

continued on page 25

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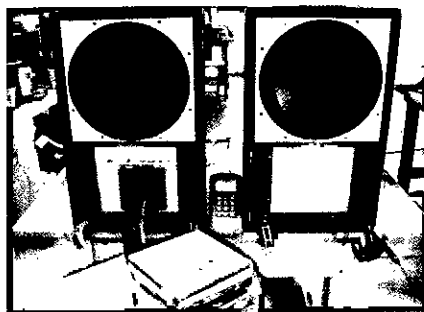


Figure 9

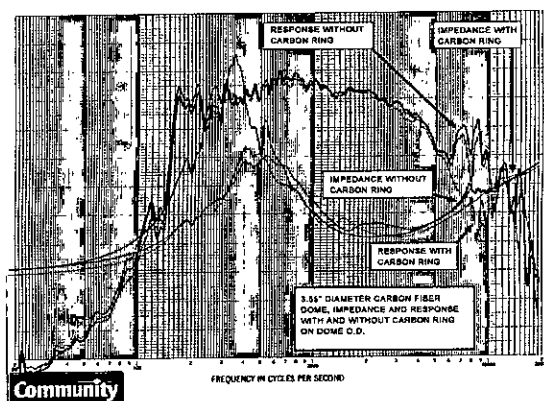
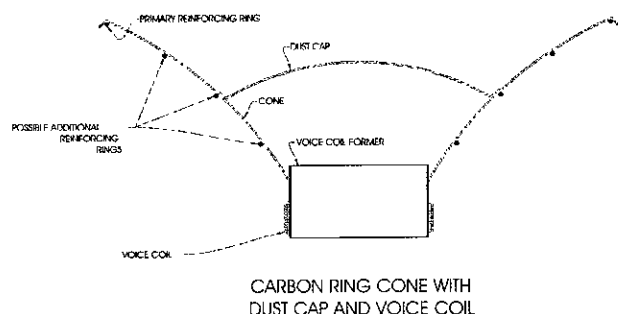


Figure 10



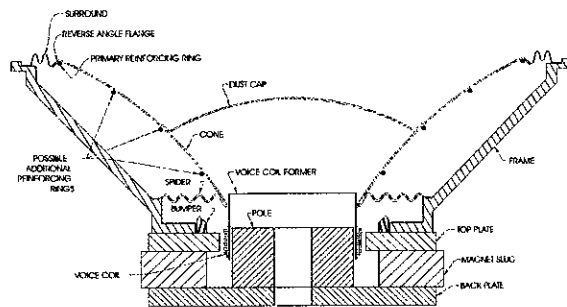
CARBON RING CONE WITH DUST CAP AND VOICE COIL

Figure 11

Cone Drivers - continued from page 23

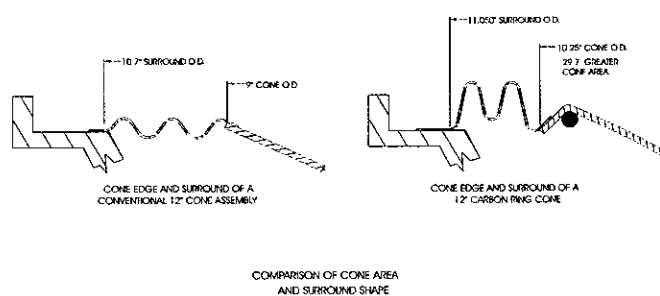
Figure 14 is an illustration of the two surrounds at excessive forward excursion. The conventional surround usually contributes significantly to the spring force of the cone assembly. This works well when cone excursion is within reasonable limits, but if the forward travel of the cone becomes excessive, the spring force of the surround can easily crack the edge of the cone. In contrast, the surround of the carbon ring cone will simply deform when subjected to excessive forward excursion, applying little additional force to the cone edge. The increased strength provided to the cone edge by the carbon ring plus the absence of high restoring force in the surround renders the carbon ring cone virtually immune to cone edge failure.

Looking back at Figure 12 it will be seen that the carbon ring cone is quite deep. The intention was to make the distance between the surround and the spider as large as possible in order to provide the maximum resistance against cone rocking. Putting the spider as close to the voice coil as possible could also have been beneficial in maintaining both radial location and roundness of the voice coil. However, locating the spider close to the voice coil has one drawback, a fact that became clear in power testing the first prototype.



SECTIONAL VIEW OF A LOUDSPEAKER EMPLOYING A CARBON RING CONE ASSEMBLY

Figure 12



COMPARISON OF CONE AREA AND SURROUND SHAPE

Figure 13

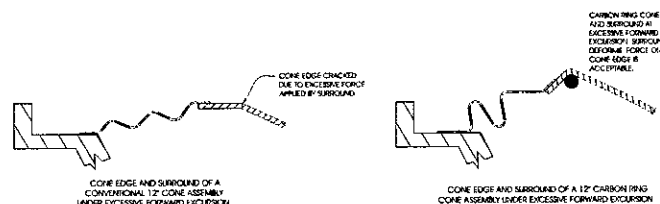


Figure 14

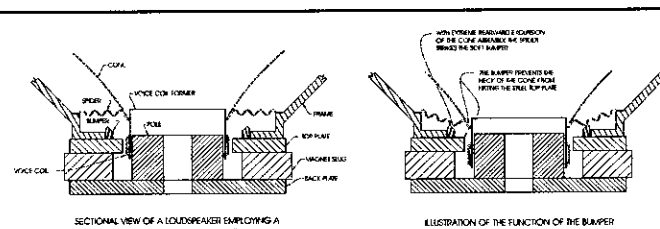


Figure 15

Excessive forward excursion was handled nicely by the new surround, but excessive excursion in the other direction caused the cone neck joint to bottom out on the top plate, promptly destroying the new cone assembly.

To remedy this situation without moving the spider forward, a rubber bumper ring was added to the top plate just outside the magnet gap. The inner corrugation of the spider will strike the bumper a few millimetres before the neck joint would hit the top plate. This is illustrated in Figure 15. Further power tests indicated that this little bumper was serving its intended function, and there was no further bottoming against the top plate.

The next three figures are photos of a prototype 12-inch woofer with two

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Cone Drivers - continued from page 25

carbon rings. Figure 16 is a rear view, and Figure 17 is a close up of the two carbon rings. The rings on this prototype were installed after the woofer was assembled, which accounts for their somewhat uneven appearance. Figure 18 shows the cone and surround from the front.

The prototype 12-inch woofer was originally assembled without carbon rings. Figure 19 shows an impedance curve of this woofer in a vacuum chamber, and also a response curve in a vented enclosure. (Vacuum impedance is useful because it eliminates any air related mechanisms and shows only mechanical results). The impedance curve shows some major break-up at 460Hz and another one about 2500Hz. The response curve shows a hole suspiciously near the 460Hz impedance spike, and a response peak in the vicinity of the 2500Hz impedance spike.

Figure 20 shows similar response and impedance curves for the same woofer with a carbon ring in the groove formed by the flange around its outer edge. The impedance curve shows that the break-up that was at 460Hz has now been moved up to 630Hz, and its magnitude is reduced. This is similar to the percentage of change seen when the carbon ring was added to the 90mm dome. The response hole that was centred at 460Hz has been fairly well filled in. The impedance and response bumps at 2500Hz have not been affected at all, indicating that they result from a different mechanism. It is interesting to note that the primary resonant frequency of about 54Hz is virtually unchanged by the addition of the carbon ring, showing that the ring has added very little mass to the cone. The moving mass of this cone assembly with the ring is about 35.6g (with about 15g of that being voice coil). The carbon ring contributed about 1.3g of that mass.

Figure 21 shows response and vacuum impedance results when a second carbon ring was added to the cone at approximately 190mm diameter. The curves indicate little difference from the previous test. The break-up is still at 630Hz, although its magnitude seems to be reduced slightly. A difference might be heard between these two versions, but not much shows up on the test data.

The performance of these new carbon ring cones, along with their new surrounds and rubber bumpers, seems to be promising. Community Light and Sound will be introducing the first products employing these components during 2006, and we will see how well they live up to expectations.

This article is based on Bruce Howse's presentation at Reproduced Sound 21. Bruce is with Community Light & Sound, Inc, 333 East Fifth Street Chester, PA 19013, USA.

email: bhowze@loudspeakers.net

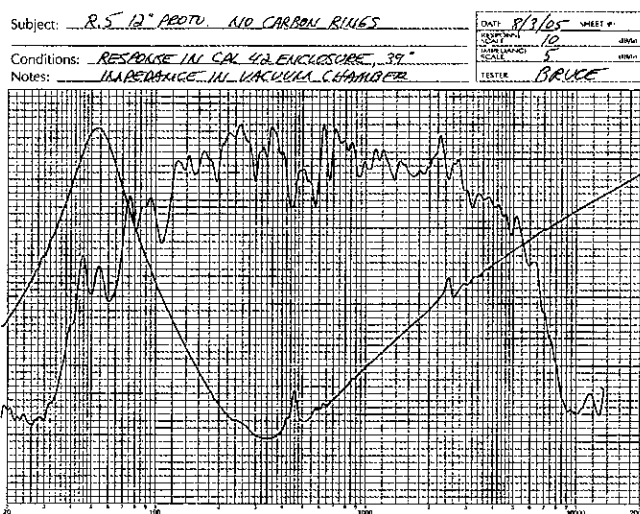


Figure 19

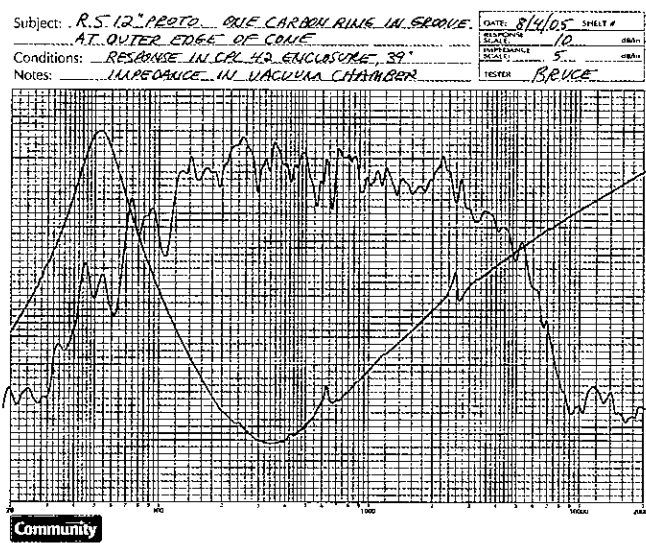


Figure 20

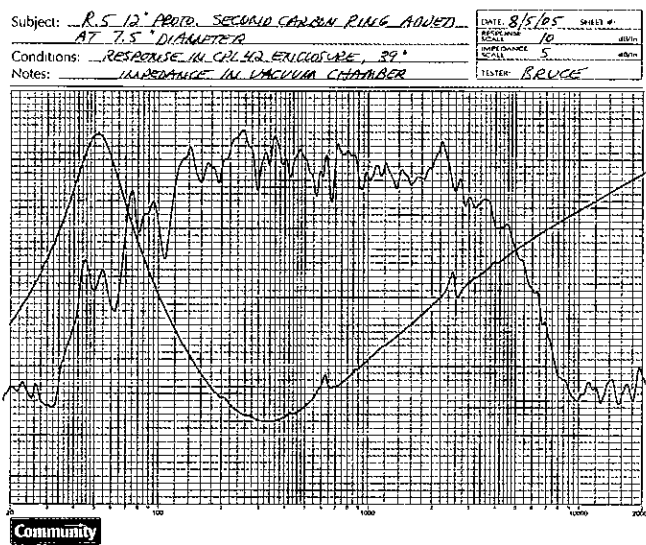
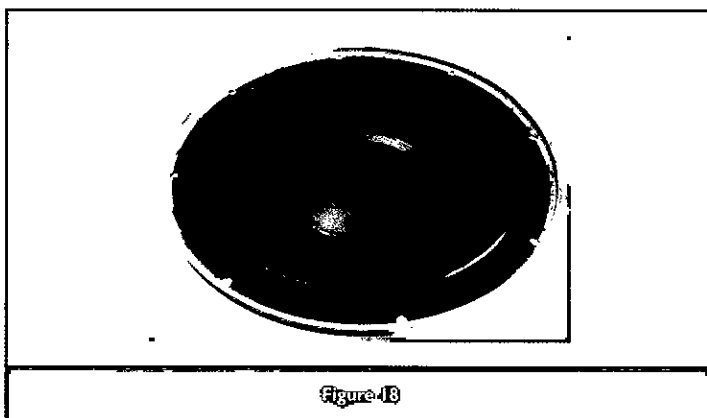
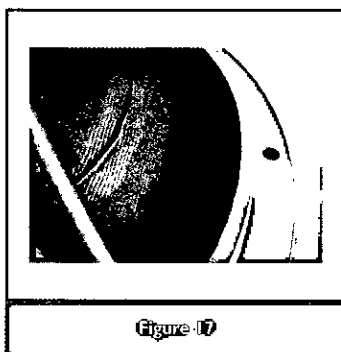
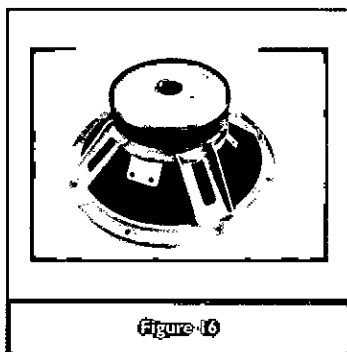


Figure 21



The CRASBO

Dave Strevens MIOA. A new tool for environmental noise control

Introduction

The Crime and Disorder Act 1998 was a step-change in local authorities' involvement in tackling anti-social behaviour (ASB). Since then, there has been an explosion of legislation on ASB and "envirocrime" with new offences and much tougher enforcement mechanisms being brought in. This has given practitioners Anti-social Behaviour Orders (ASBOs) and, more recently, ASBOs on Conviction (CRASBOs). Seizure of vehicles used in envirocrime (fly-tipping) is now on the agenda, as are powers of arrest. At the same time, there has been much emphasis on speeding up enforcement, notably by means of Fixed Penalty Notices (FPNs). The importance of the ASB issue, and the speed of change, is illustrated by the major government ASB web sites^{(1), (2)}, an essential information source for anyone working in this field. There is massive political will behind these changes, reflecting obvious public concern. Indeed, early September 2005 saw the Prime Minister personally re-launch the Government's 'respect' agenda. This demonstrates how the entire landscape of ASB, Public Realm and Cleaner Neighbourhood enforcement has changed - indeed, these phrases simply did not exist eight years ago! Those practitioners involved in environmental (or neighbourhood) noise control will appreciate that noise nuisance sits firmly at the junction of ASB and envirocrime. Indeed, Home Office data⁽³⁾ shows noise nuisance to be amongst the most common types of ASB, with 5374 reports in a single day, costing an estimated £249million per year. In an effort to tackle this, these new enforcement tools - especially the CRASBO - can very usefully be added to the traditional statutory nuisance enforcement regime. How they are used will depend on local needs, service structures and enforcement styles. However it is done, it is clear that central government expects local authorities to tackle ASB, and Environmental Health staff are at the sharp end of that effort. To help practitioners, mid-September 2005 saw the Chartered Institute of Environmental Health launch an ASB toolkit⁽⁴⁾, endorsed by the Home Office and dealing with environmental crime such as noise, abandoned cars, flytipping, graffiti and fly-posting.

This article outlines something of the author's experience of using CRASBOs and tries to pass on what has been gained from a very steep learning curve. The main issues centre around the drafting of effective and enforceable conditions, including the application of the Human Rights Act. Not only do practitioners need to convince the Court of the necessity for granting a CRASBO, but we have to understand that the Court effectively 'owns' the CRASBO. The need for multi-agency working is highlighted, and the challenges of enforcement are also considered.

Anti-Social Behaviour Orders (ASBOs)

An ASBO is a very powerful Civil Court Order. Breach of an ASBO brings in power of arrest, fines and imprisonment. ASBOs are obtained to curb behaviour which has caused, or is likely to cause, harassment, alarm or distress to one or more persons not in the same household as the offender. They are obtained in County Court, on the balance of probabilities, using hearsay evidence. The conditions imposed by an ASBO can be very wide: they can prohibit any form of ASB and can prohibit a person from entering a defined area. Note that they can only prohibit specified anti-social behaviour, not force persons to undertake actions or to behave in a particular pleasant manner. Of particular interest to noise practitioners are options such as:

- Prohibiting causing noise nuisance, or prohibiting audible noise during certain hours;
- Prohibiting use of certain equipment (say, no television after 11pm or before 8am);
- The possibility of prohibiting activities such as begging, drinking, being drunk in certain areas;
- Proscription of meetings with certain people, visiting specific

addresses, or entering certain areas (even entire cities);

- Prohibiting acts such as spitting, exposing oneself, wearing hooded clothing (which prevents easy identification), swearing, aggressive behaviour and violence towards persons (including council staff).

For the noise practitioner, getting an ASBO is not particularly simple. First, proceedings are usually in the County Court (a Civil Court), whereas most of a Pollution Control Officer's expertise is in the Magistrates' (Criminal) Court. Second, they are relatively expensive. Third, there is a statutory need to consult other agencies (Police, Social Services, Education) as necessary. Multi-agency working is obviously essential if solutions to difficult problems are sought, but this can be an obstacle to speedy action. Fourth, ASBOs are generally still seen as being a very serious step, and would not be appropriate for a simple noise nuisance case. Having said this, their use is accelerating, mainly driven by management of Housing Departments, but they are still little (if ever) used by Environmental Health (although such department's officers can and do give evidence in support of Housing.

Anti-Social Behaviour Orders On Conviction (CRASBOs)

The CRASBO has virtually identical powers to an ASBO - there is the same power to set conditions, with the same enforcement powers. This relatively new legislation has been fully explained by Pema and Heels⁽⁴⁾ and by Carr et al⁽⁵⁾. Most importantly for the noise practitioner, the CRASBO is much easier to obtain than the ASBO. There is no need for the extensive consultation of an ASBO (but the Police must be consulted if they are going to be expected to enforce the conditions). More importantly, an expensive County Court case is not necessary: "piggy-backing" on a successful criminal conviction, the CRASBO is effectively free!

To gain a CRASBO, behaviour must be shown which has caused or is likely to cause harassment, alarm or distress to one or more persons not in the same household as the offender, and that without the CRASBO, it will continue. So, practically, a pattern of behaviour must be demonstrated, possibly of a more serious nature (than in a "normal" noise case), possibly over a long period and possibly with previous seizures or convictions which failed to stop the problem.

The CRASBO is obtained in the Magistrates' Court, following any criminal conviction. This is very useful because the hard work has already been done - a conviction has just been obtained on the basis of 'beyond reasonable doubt'. As soon as the 'guilty' verdict is handed down, a CRASBO is requested. The Court sentences the guilty party and the hearing should then move seamlessly from a criminal trial to a civil hearing. The Justices' Clerks' Society Good Practice Guide⁽⁶⁾ is an authoritative reference for Court procedures at this stage and Strevens⁽⁶⁾ gives more practical advice on presentation of evidence.

The Court can base their decision on the evidence that has just been heard, but new evidence can also be introduced. Care is needed here, as anything other than previous convictions can be challenged, taking up what limited Court time there may be and possibly derailing what should be a very quick process. At Greenwich, the strategy has been to produce a single side of A4 paper summarising previous convictions, witnessed events, number of complainants, number of calls to the out-of-hours service, etc. If granted, the CRASBO can address any ASB - obviously, those matters on which offender has just been found guilty, but also any wider issues of ASB. So, if found guilty of noise nuisance, alcohol or substance-related issues, or other behavioural issues, can be added. The CRASBO appears to be the perfect 'add-on' to statutory nuisance prosecutions. They allow the enforcement action to be escalated past a simple prosecution and they give the victim much better protection than simple fines.

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The CRASBO - continued from page 27

Greenwich Experience With CRASBOS

Greenwich Council's Noise Team applied for its first CRASBO in August 2004. The story of how it was unsuccessful has already been told^[6] but, even so, it was considered useful to have tried. The case concerned loud amplified music affecting up to ten complainants over a five-year period, as well as unreasonable impact noise (footfalls) additionally affecting the neighbour immediately below the defendant's flat. In that time, there had been over 60 calls to the Council's Noise Line and 20 witnessed nuisances (of varying degrees of seriousness). However, owing to the length of the investigation, at any one time staff never considered there was enough to prosecute until the decision was taken in August 2003. Nuisance continued even after summonses were issued, and defence delays meant the case did not get to Court until July 2004. The District Judge eventually gave a three year conditional discharge (the maximum length permissible) along with substantial costs (£750). He suggested that the defendant should have pleaded guilty, and commented on the waste of Council resources caused by the "hopeless" defence case.

In March 2005, the Greenwich Noise Team successfully obtained its first-ever CRASBO, on a similarly serious case. The defendant had previously had their stereo seized and had been prosecuted for seven breaches of an Abatement Notice. They went quiet for a time, but then antisocial noise started up again, leading to a second seizure of a stereo system and a prosecution for a further 11 breaches of the Abatement Notice. After discussions with the legal team, the defendant pleaded guilty to six counts and a CRASBO was granted. Lunney^[7] gives more information on how this case progressed. July 2005 saw the Greenwich Noise Team gain its second CRASBO. Again, it was a fairly serious case, with the defendant being previously prosecuted for six breaches of the Abatement Notice. Almost a year of peace and quiet followed, but ended with eight more breaches of the notice being witnessed by Council officers and seizure of his stereo system. The CRASBO was granted.

Given the above, Greenwich has taken a policy decision that CRASBOS will be considered in every noise prosecution. Unless there are contra-indications (vulnerable person, not in the public interest) there is a presumption that application for a CRASBO is warranted where a noise abatement notice has been repeatedly ignored.

Other Recent CRASBOS

EHOs at the London Borough of Hammersmith & Fulham obtained their first ASBO on Conviction in April 2004. This case concerned a defendant where they had already seized stereos four times in the past year! In total, they had some 50 complaints from nine different complainants, and ten witnessed breaches of the abatement notice. The noise-maker was prosecuted on four breaches of the notice, pleaded guilty but tried to argue that he was a "music producer and DJ" and he only played loud music on the odd occasion. This was contrary to the evidence, and he was fined, and the ASBO on Conviction was granted.

The Metropolitan Borough of Rochdale obtained its first in June 2004. This was against a noisemaker prosecuted for four breaches of a Noise Abatement Notice. This was his third prosecution for noise, and stereo equipment had previously been seized. In this case, evidence was gathered for the prosecution using Digital Audio Tape and these recordings allowed the court to appreciate accurately the disturbance caused to neighbours. Once the guilty verdict had been won, the EPA Solicitor sat down and the specialist ASB Solicitor jumped up! The noise-maker was then made subject to a three-year anti social behaviour order which prohibited him from:

1. Acting in an anti-social manner in the Metropolitan Borough of Rochdale, that is to say in a manner which causes or is likely to cause harassment, alarm or distress to one or more persons not of the same household as himself;
2. Using, demonstrating or threatening violence against any such person;
3. Playing amplified entertainment at an excessive volume so as to

cause nuisance to neighbouring properties;

4. Playing amplified entertainment between the hours of 11.00pm and 7.00am on Sunday night to Thursday night inclusive and 12 midnight to 8.00am on Friday night to Saturday night inclusive;
5. Consuming alcohol in any public street or open place;
6. Using abusive, insulting, offensive, threatening or intimidating language or behaviour in a public place or any place to which the public have access.

August 2005 saw Caradon District Council get a particularly interesting CRASBO against the operator of a 'quad bike safari' business^{[9],[10]}. The operator ignored repeated planning and nuisance orders, but continued operate in a quiet village and cause serious nuisance. Quads (nine in total) were eventually seized and a ten-year CRASBO granted following a successful noise prosecution. The Council commented that "The length of the CRASBO reflects the seriousness of this case, which involved intimidation on top of some 15 months of severe noise nuisance for residents of the area". The CRASBO prohibits the quad operator from:

1. Assaulting, threatening harassing, using threatening behaviour, intimidating and/or otherwise abusing any person residing or visiting a designated area within the village of Morval, and Council staff;
2. Causing or allowing to be caused any noise nuisance as a result of any unauthorised recreational or commercial activity;
3. Any unauthorised advertising of any unauthorised activity.

Interestingly, in 2004, the Environment Agency^[12] obtained an ASBO (not a CRASBO) on the owner of a skip hire and plant business. This prohibited him from repeatedly burning skips of rubbish, rather than disposing of it legally. A similarly interesting example of an 'envirocrime' ASBO comes from Thanet District Council^[11], who in September 2005, obtained an ASBO against a persistent fly-tipper. Other local authorities have threatened companies involved in fly posting with CRASBOS. These cases demonstrate the width of the ASB and envirocrime agenda and just how it is complementing (perhaps taking over from) more traditional enforcement options. It is interesting to note that these cases involved businesses, albeit sole traders.

Human Rights Issues

Human Rights concerns with ASBOs continue to fester, but practitioners and (more importantly) the wider public appear to have accepted this form of enforcement. There are possibly fewer issues with CRASBOS, as a "guilty" verdict (beyond reasonable doubt) has already been established. The fact that the noise abatement notice has already been breached (perhaps repeatedly) makes it more reasonable to seek a more serious enforcement option. In all of this, it is important not to lose sight of the rights of victims - Environmental Health are often the only agency sticking up for the victim, especially in private sector housing. Lunney^[7] has outlined the practicalities of literally debating Human Rights in Court. To obtain Greenwich's first-ever CRASBO, she had to argue a sequence of options with the Court, before settling on a wording which (with hindsight) was found to be less than perfect. That experience brought the realisation that an officer must be fully prepared to justify and debate the preferred draft wording. Draft conditions must be:

1. Necessary: the defendant has been convicted of playing loud amplified music - must he be prohibited from making DIY noise?
2. Proportionate: is silence from the defendant's home 24 hours a day necessary? Probably not, but after victims have suffered months of serious nuisance, it is arguably reasonable to insist that they now get silence during the night.
3. Realistically practical: can the defendant know whether they are complying? Can the conditions be enforced?
4. Clear, concise and accurate: what type of noise, caused by what? Can the defendant understand what is expected of him?
5. Specific about matters of time and place: addresses, days of the week and 24-hour times need particular care.
6. Not mandatory: wording must not compel the defendant to do

specific acts as the CRASBO can only prohibit behaviour.

7. Possible to be complied with: a conditions must not be worded so the defendant is bound to breach it.

Do not be mistaken, an enforcing officer can interfere with the defendant's Human Rights, but any interference must be necessary and proportionate, and balanced with the victim's rights.

Drafting Conditions

The importance of careful drafting cannot be over-stressed. It has already been mentioned how a debate in the Magistrates' Court led in Greenwich's case to conditions which were less than perfect. The Borough's first CRASBO was almost unenforceable because of two missing words! The wording given by the Court was:

"The defendant is prohibited from using any electrical equipment to generate noise which can be heard outside his front door between 8pm and 6am daily."

On first examination, this appears marvellous. If noise is not audible outside the defendant's front door, then it is unlikely to be causing a nuisance to neighbours (subsequent experience in this case showed this was correct). Better still, anybody (Noise Officer, Police or neighbours) can witness noise from "electrical equipment" outside the defendant's front door and if it is outside the permitted hours, it is a breach of the CRASBO. The defendant can then be arrested. Unfortunately, it was not that simple. Leaving aside judgements about "electrical equipment", this condition had one major flaw: it had to be proven that it was the defendant personally who was making this noise. Not only did the noise have to be heard outside his front door, but the officer then had to knock and ask the defendant if it was him making the noise! Put simply, experience shows that in general, an enforceable condition must be one that includes the words "or permits". This relatively small change makes all the difference:

"The defendant is prohibited from using, or permitting to be used, any electrical equipment to generate noise which can be heard outside his front door between 8pm and 6am daily."

The above formula does away with the need to prove the defendant was personally making the noise. It makes it relatively easy for anybody to witness a breach. It also allows the defendant to check his own compliance (a useful Human Rights check). Whilst it might be thought better to prohibit noise audible anywhere outside the defendant's property, the ability of the defendant to check would then be lost: the Court thought that much less reasonable. Finally, the formula provides a high level of protection to the victims.

Proving Harassment, Alarm Or Distress

Being able to prove that the defendant has behaved in a manner causing or likely to cause harassment, alarm or distress is fundamental to obtaining a CRASBO. Now, a statutory noise nuisance will almost always cause (or will be likely to cause) distress, and sometimes it will be beyond reasonable doubt, so the test of "likely to cause" harassment alarm or distress should be sufficient to obtain a CRASBO. Interestingly, in one of Greenwich's two CRASBOs, the District Judge seemed to want more than this. The Judge knew that the Council would ask for a CRASBO if the defendant was found guilty and so, during the statutory nuisance case (before the CRASBO hearing began), he asked every Noise Officer giving evidence of nuisance "What was the state of mind of your complainants?" Luckily, several witnesses had notes of the effects of the noise on the complainants, and so could

answer. But, this is not normal practice for statutory nuisance cases, where the effect on the notional average person is relied upon, rather than the effects on a specific complainant.

The lesson here is an Environmental Health Officer should be prepared to give evidence about the effects of the noise on the complainants. The Greenwich Noise Team is considering adding this question to the noise call-out proforma. This will perhaps require officers to check the effects of the noise on the complainants, but only in a box marked "For ASB use only - NOT for nuisance decisions".

Ownership Of The CRASBO

Those involved in noise enforcement are probably used to drafting, and hence 'owning' noise abatement notices under the Environmental Protection Act 1990. However, with CRASBOs, the matter is entirely in the hands of the Court; it is a Court Order, drafted by the Judge or Magistrate and issued and enforced by them. The local authority will suggest a wording, but the decision is the Court's. So, the officer attending Court has to be ready to debate wordings and justify any draft that is offered. Officers need to be assertive, and honest, in order to explain (if needed) why a particular wording offered by the Court will not work. Lunney^[7] gives an example of how suggestions were rejected because they did not work acoustically, or in terms of enforcement.

Enforcement is also in the hands of the Court, and this leaves the noise enforcement officer in something of a quandary. Should he or she make decisions about enforcement, or leave them to the Court? To some extent, this depends on what route is taken to enforcement (see below), but it is suggested that if there is any reasonable evidence of breaches, the officer should err on the side of caution and let the Court decide. If there was evidence of several breaches of the Court's CRASBO, the last thing anyone would want is a Judge asking why the Council had not been quicker in bringing this before the Court. Why did an officer presume to make judgements the Court should be making?

Enforcing The CRASBO

As yet, the Greenwich Noise Team has no experience of enforcing a CRASBO, nor any information on whether others have done this yet. However, one case at least came close to this stage, and that led to consultation with other practitioners when thinking about the next step. There are several options, not at all clear-cut.

• Leave it to the Police

This is a seductive option. After all, the CRASBO is a serious Court Order, with powers of arrest and penalties for a breach including up to five years in prison. Surely the Police should be enforcing it? They can witness a breach, arrest the defendant, interview them at the Police Station and then give the case to the Crown Prosecution Service (CPS) to deal with. However, despite the order being serious, recent experience is that the Police simply cannot react to witness noise; it is not that they do not want to (they clearly appreciate the effects on victims), but they have work of far higher priority, especially in inner cities. The reality is that most local authorities will have a much better response to noise than the Police. The local authority is almost certainly the agency best placed to get evidence of breaches on a noise

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The CRASBO - continued from page 29

CRASBO. Perhaps more importantly, the local authority will have dealt with the victims and witnesses through a tortuous process, and handing the case over to the CPS at this stage might not be very effective.

• Partnership, with local authority prosecuting

Given the above, some sort of partnership approach will probably be most effective. How this will work depends largely on local circumstances, multi-agency structures and working relationships. For example, noise enforcement staff could witness a breach and then make statements of witness (Section 9 statements) for the Police, who are requested to arrest the defendant. With effective liaison, the local authority Solicitor could be in Court when the defendant is brought in by the Police (this process is already used in child protection and fraud cases). The local authority Solicitor then takes the case.

• Partnership, with CPS prosecuting

This works in the same way as the above, but the CPS uses local authority evidence to take the case.

Of course, none of the above rules out using evidence from victims, neighbours, Housing staff, Police and any other decent witness. Perhaps the most important issue will be to make sure there is effective liaison between the various agencies.

The Future

It really is early days for noise CRASBOs. They are increasingly being used, but practitioners face a daunting learning curve and are, understandably, being cautious. However, several issues are already possibilities for the future.

First, local authorities should consider the practicality of getting noise conditions added to Police CRASBOs. The Police are increasingly using CRASBOs for drunk and disorderly cases, drugs, violence, etc; the defendants involved in these forms of ASB are very likely the same people involved in anti-social noise. Can they be identified, so that systems to deal with the noise aspects of their ASB can be set up at the same time that the Police bring the other issues before the Court?

Second, local authorities should add CRASBOs to their Enforcement Policies, along with seizure of stereos and multi-agency working for those involved in other forms of ASB (as above). Policies should state very clearly that a CRASBO will be considered on every prosecution - not just for serious cases, but for every case where an abatement

notice has been repeatedly breached. The possibility of imprisonment and unlimited fines should be clearly noted. The publicity aspects of CRASBOs should also be flagged up.

Finally, CRASBOs can be considered for more than just domestic noise. There are examples where ASBOs have been used on businesses, or at least sole traders. If responsibility can be apportioned, there is no reason why they could not be used for partnerships, and perhaps for named directors or even managers of limited companies.

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The views expressed in this article are those of the author and do not necessarily reflect those of his employing authority.

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Raising The Tone

Bernard Berry FIOA & **Nicole Porter** MIOA. Results from a workshop on tonal assessment

Introduction

In the vol.30 no.6 of Acoustics Bulletin (November/December 2005) a short account was given of a Workshop, held at the end of the first day of the 2005 Autumn Conference, in which delegates had the chance to listen to, and assess a range of industrial noises with differing degrees of tonal content. It was not possible during the Conference itself to produce any practical results of the Workshop. This article summarises the main outcomes.

Background - The Pompetski Experiment

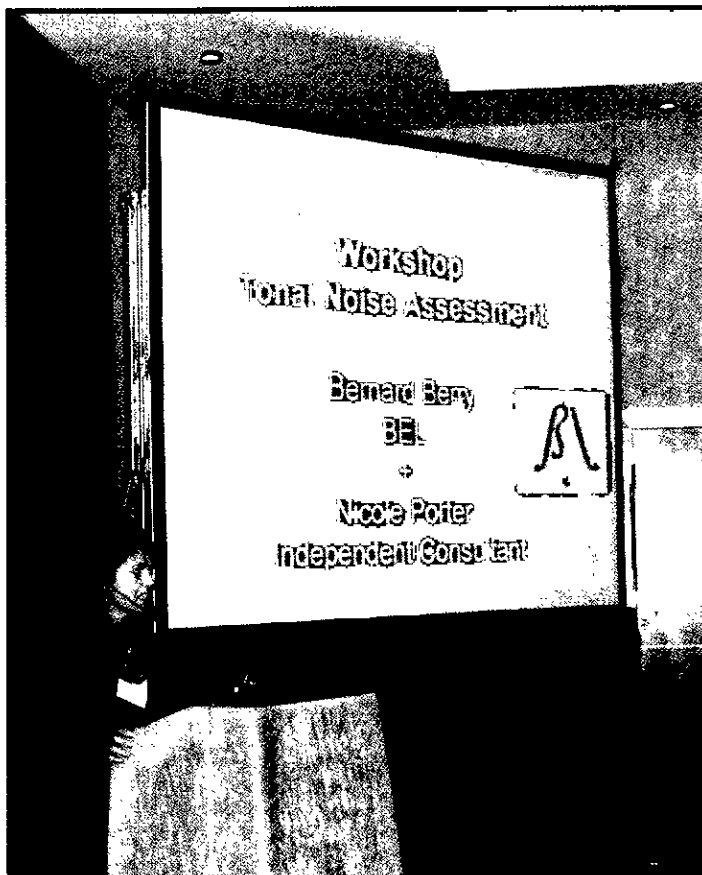
During the Conference, Bernard Berry presented a paper on one of the three "Work Packages" which made up a recently completed DTI-funded research project on Environmental Noise.^[1] The work package involved, over two years, a critical review and inter-comparison of methods of quantifying acoustic

features in environmental noise, such as tones and impulses, in order to establish a recommended objective method of classification.

One part of the review project had involved re-analysing a number of industrial noises with tonal content, which had previously been used by W Pompetski in Germany. Pompetski had published a paper at a DAGA conference in 1998^[2] describing an experiment in which a large number - 114 - of equivalents of our UK Environmental Health Officers were sent a CD with 14 recorded sounds and a reference pink noise for setting the listening level etc.

They were asked to find a 'quiet undisturbed place and allow themselves some time'. They were then asked to listen to the sounds, and assess if there were tonal components, such as '...droning, whining, singing, screeching and whistling...'

Note that our BS4142:1997 uses the words 'whine, hiss,



Nicole Porter introduces the listening experiment at the 2005 Autumn Conference, Oxford Hotel

screech, hum, etc'. They were also given a score sheet, with a scale of: 0 1 2 3 4 5.

Sound 1	0	1	2	3	4	5
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This corresponds to a 'tonal penalty' between 0 and 5dB. If such components were 'clearly heard' then this would merit a 5dB score, or penalty, for that particular noise.

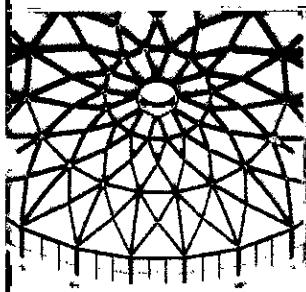
If, in their view, no tonal component was present, a zero score would be marked. Intermediate scores were to be assigned if the judged degree of tonality required it.

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The listening panel at Oxford, demonstrating the benefits to concentration accruing from the 'fruit of the vine'

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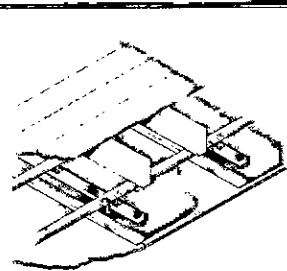
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Raising The Tone - continued from page 31

Our Workshop

In our Workshop we first of all identified, then listened through, each of the 14 sounds, so that our listeners had an overall idea of what they were.

Each sound lasted for about 30 seconds. Listeners were asked not to mark them on the first run-through. On the second run-through, they listened and marked a score sheet.

They had about 10 seconds to mark a score before the next sound.

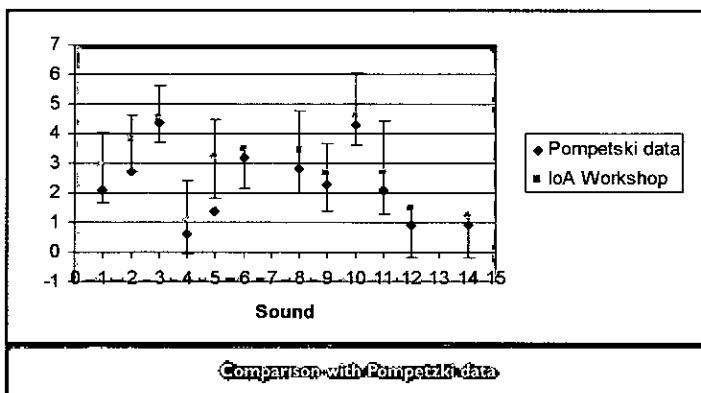
At the end of all the 14 sounds, they were asked to inform us using the tick boxes whether they considered themselves to be experienced or inexperienced at judging tonal content, and to note any other general comments.

As has been noted in the earlier Bulletin, listeners showed a remarkable degree of silent concentration during the half-hour or so required.

Results

In all, 57 completed marking sheets were collected and the data later analysed. For each of the 14 sounds, the mean score and standard deviation were calculated. Of the 57 listeners, 18 rated themselves as 'experienced' in tonal assessment.

The graph shows the mean subjective ratings for each sound, [square symbol] together with error bars at plus-or-minus one standard deviation. To give a direct comparison with the



original experiment, the mean data from that are shown [diamond symbols].

It can be seen that the two sets of results are very similar, which is perhaps surprising given the differences between the conditions in which the two sets of assessments were made. In only one case, Sound 5, is there a difference greater than one standard deviation. Sound 5 was a recording in a cabinet makers' shop, and had a very complex temporal pattern. In some cases there was remarkably close agreement: for example, Sound 3 was a recording of hydraulic pumps with a prominent buzzing hum.

Conclusions

Using the captive audience of an IoA Conference Workshop, a successful re-creation of an earlier experiment on tonal assessment was achieved. The mean subjective ratings of the sounds were remarkably similar to those obtained by Pompetski.

The full Report of the DTI-funded project will be available on the web at <http://www.hla-projects.co.uk/>.

Bernard Berry FIOA is Director of Berry Environmental Ltd and also the Institute's Vice President: International. **Nicole Porter** MIOA is an independent consultant

Acknowledgements

We would like to thank the delegates who took part, Ken Dibble for his role in playing-back the recordings, and Ian Campbell for his help with the workshop.

References

- [1] B F Berry and N D Porter, 2005. A review of methods for quantifying acoustic features in environmental noise. Proceedings of the Institute of Acoustics, Volume 27, Part 4, 2005.
- [2] W Pompetski, 1999. Vergleich der Tonhaltigkeit nach DIN 45 681 mit subjektiven Bewertungen, Fortschritte der Akustik DAGA 98, P224-225, 1999.

Current Policy On Environmental Noise

Wendy Hartnell MIOA.

Introduction

This article provides an overview of the Government's current policy on environmental noise. It covers progress in the development of a National Ambient Noise Strategy, the EU Environmental Noise Directive and its implementation in the UK, and the review of planning policy guidance.

National Ambient Noise Strategy

The Government consulted on the need for a strategy for environmental noise in 2001, in its paper 'Towards a National Ambient Noise Strategy'. The need for a national ambient noise strategy was emphasised in the Rural White Paper of 2000 and the UK Sustainable Development Strategy of 2005. The Government is committed to agreeing a strategy by the end of 2007. A separate strategy is being developed for neighbourhood noise.

The consultation paper proposed that the strategy should consist of three phases:

Phase 1 would aim to establish:

- The ambient noise climate in the country. In simple terms, the number of people affected by different levels of noise, the source of that noise (ie road, rail, airports and industry) and the location of the people affected;
- The adverse effects of ambient noise, particularly regarding people's quality of life. Special consideration will also be needed in regard to tranquillity;
- The techniques available to take action to improve the situation where it is bad, or to preserve it, where it is good; and
- The methodology to be used to undertake economic analysis.

The objective of Phase 2 would be to evaluate and prioritise options for action identified in Phase 1 in terms of the costs and benefits, including the synergies and conflicts with other Government priorities



The 2007 noise maps will also include industries in population centres above a certain size

(such as other environmental, economic and social issues).

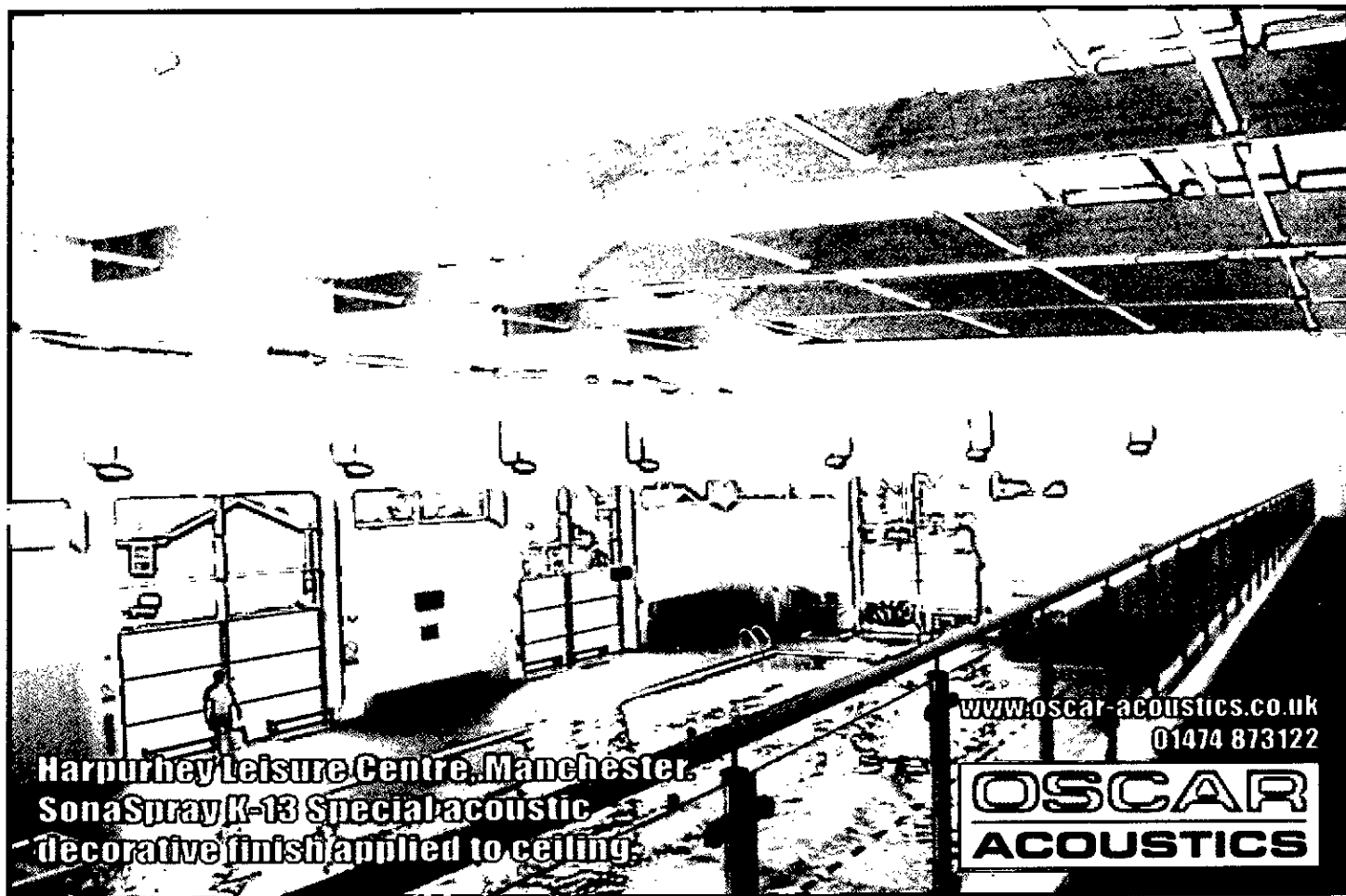
Finally, in Phase 3 the Government would need to agree on the necessary policies to move towards the desired outcome, ie the completion of the National Ambient Noise Strategy. Work has already started on the mapping of major roads. Mapping of other ambient noise sources will be taken forward under the UK's commitments to comply with the EU Environmental Noise Directive. This work will take place during 2006. In parallel with this, it is a high priority for Defra to begin discussions with stakeholders on the strategy during 2006, with a view

to the agreement of high level objectives.

Environmental Noise Directive

The Environmental Noise Directive (2002/49/EC) requires member states to produce by 2007 noise maps for major road, rail, and aviation sources, and agglomerations of a specified size (with the last definition

continued on page 34



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Current Policy On Environmental Noise - continued from page 33

also incorporating ports and industries). Its aim is to provide information on environmental noise and its effects on the general public through a system of mapping. Scotland, Wales and North Ireland are writing regulations and implementing the Directive independently. The English mapping project is already under way and the regulations are in the final stages of composition, with a technical consultation to be held shortly. Once these regulations are complete they will be presented to Parliament. The noise maps will identify areas both of significant noise (which needs to be reduced) and of tranquillity (which needs to be preserved). From this information action plans are to be produced by the competent authority, as outlined in the regulations, in 2008. The Secretary of State will be responsible for producing both the noise maps and the action plans (except for 'non-designated' airports). The next steps on which Defra will be working are devising criteria and addressing the priorities that need to be addressed in the action plans.

Planning Policy Guidance

Existing planning policy guidance is set out in Planning Policy Guidance 24 (PPG24). This document provides advice on how planning systems should be used to minimise the adverse impact of noise without placing unreasonable restrictions on development, adding unduly to the costs, or increasing the administrative burdens on business. The main thrust of the document is to ensure either that noise-sensitive development is separated from major noise sources, or new potentially noisy development is not placed amongst noise-sensitive land use.

The Government is in the process of reviewing its guidance. This is part of a general policy set out in the 2001 Green Paper 'Planning: Delivering a Fundamental Change' to review all planning guidance. The aim is to provide shorter and more succinct policy statements which

are integrated with other strategies and plans and which are in tune with the Government's policy to promote and achieve sustainable development.

There are further reasons why this guidance should be reviewed now. PPG24 was created ten years ago and the world has moved on. Increasingly, there is a need to recognise that it is becoming difficult to reconcile brownfield development policies with the current guidance to separate noisy and noise-sensitive developments. Furthermore, the World Health Organisation (WHO) guidelines which underpin PPG24 were revised in 2000. The opportunity needs to be taken to provide more technical guidance in a companion document to the policy statement. This technical guidance is likely to include:

- The measurement and assessment of noise;
- Sources of noise: civil aircraft, road, rail, industry, commercial, sport, recreation, and MOD airfields and establishments;
- Noise receivers: residential properties, schools, hospitals and amenity areas;
- Examples of planning conditions.

Moreover, since the PPG24 document was created, more technical guidance has become necessary.

The policy statement for the PPS24 document, as it will be known, has been agreed by the steering group and is currently awaiting legal clearance whereas the companion guide is currently under discussion in the technical working group. Once these have been finalised they will be presented to a public consultation in 2006.

Wendy Hartnell MIOA is with DEFRA
wendy.hartnell@defra.gsi.gov.uk

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Parliamentary Reports

From Hansard

Commons Debates

16 February 2006: Business of the House

Richard Younger-Ross (Teignbridge) (LD): Will the Leader of the House ask the Deputy Prime Minister or one of his Ministers to make a statement on noise and disruption caused by construction works, particularly overnight working, the powers of the local authority to control that through planning and environmental health measures, and perhaps the moral duty of contractors and developers such as Asda, which is building a supermarket in my constituency, to compensate people kept awake at night because of the necessity of overnight working?

Mr Hoon: I recognise that construction can cause temporary disruption to people's lives, and no doubt the hon. Gentleman has raised the matter directly with the company concerned. I have sympathy for those affected, but I am sure that he would welcome the employment prospects provided by construction and the opportunities provided by a new supermarket for employment in his constituency.

Commons written answers

16 January 2006: Motorway resurfacing

Mr Greg Knight: To ask the Secretary of State for Transport what criteria are used when deciding whether to resurface a motorway for the purpose of reducing tyre noise; whether such work is always held in abeyance until the road surface in question needs replacing; what the typical additional cost of such work is over normal resurfacing; and if he will make a statement.

Dr Ladyman: During the assessment of the Highways Agency's Spending Review 2004 submission, Ministers agreed that the resurfacing of concrete roads ahead of maintenance need, for noise reasons, would not be allocated funding.

The Highways Agency resurfaces sections of carriageway for the purpose of reducing tyre noise where there is a maintenance requirement, where it is required on safety grounds (due to loss of surface texture required for skid resistance in the wet), or as a result of general wear and tear caused by traffic.

The carriageway maintenance programme is developed on a whole life cost basis, identifying the appropriate maintenance treatment at the optimum time. When resurfacing a carriageway, it is standard Highways Agency practice to use quieter surfacing materials. There is no additional cost for these materials compared with conventional surfacing materials as they can be laid quickly; therefore, the overall laying costs are a lot less.

17 January 2006: Night flights

Mr Pelling: To ask the Secretary of State for Transport what his Department's policy is on the number of night flights over London.

Ms Buck: Noise from aircraft operations at night is widely regarded as the least acceptable aspect of aircraft operations. We believe in bearing down on night noise, striking a fair balance between local disturbance, the limits of social acceptability and

the economic benefit of night flights. This should be done on a case-by-case basis.

Adam Afriyie: To ask the Secretary of State for Transport (1) whether he has notified the European Commission of the night flying restrictions that will apply at Heathrow when the present restrictions expire; and (2) when he expects to announce the night flying restrictions that will apply at Heathrow when the present restrictions expire.

Ms Buck [holding answer 16 January 2006]: The Government will announce their conclusions on future night flying restrictions to apply at Heathrow airport in due course. Directive 2002/30/EC established rules and procedures with regard to the introduction of noise-related operating restrictions at certain EU airports. The Government must follow these rules and procedures in making decisions about night flying restrictions at Heathrow. The Directive does not impose any requirement for prior notification of new operating restrictions to the Commission. We have not submitted any information on future night flying restrictions at Heathrow to the Commission.

19 January 2006: Aviation policy/safety

Lynne Featherstone: To ask the Secretary of State for Transport what assessment the Government have made of the effect of its aviation policy; and if he will make a statement.

Ms Buck: The Government are committed to the monitoring and evaluation of the effectiveness and impact of the policies of the White Paper. We will report by the end of 2006 on progress.

Lynne Featherstone: To ask the Secretary of State for Transport what assessment the Government have made of the effect of its aviation policy on the welfare of people who live (a) under and (b) close to flight paths; and if he will make a statement.

Ms Buck: The main impact on people living under or close to flight paths around airports relates to aircraft noise. There can also be impacts on local air quality around major airports as a result of air traffic and associated activities, such as road traffic travelling to and from the airport.

A noise level of 57dB(A) Leq (equivalent continuous noise level) over a 16-hour period is regarded as the threshold for the approximate onset of significant community annoyance. This figure was derived from government sponsored research in the 1980s, in particular "The United Kingdom Aircraft Noise Index Study" published by the Civil Aviation Authority in 1985.

The Department publishes annual daytime noise contours covering 57 to 72 dB(A) Leq for Heathrow, Gatwick and Stansted airports. These show the geographical area and estimated population numbers affected by this range of noise levels. Elsewhere it is the responsibility of individual airports to produce aircraft noise contours and a number of major airports do so.

The Government have also sponsored research into the impact of aircraft noise on sleep. The former Department of Transport published in 1992, the "Report of a Field Study of Aircraft Noise and Sleep Disturbance". This study was and remains

to date the largest survey of its kind in the United Kingdom. It was found that noise events below 90dB(A) SEL (equivalent to about 80dB(A) Lmax) were unlikely to affect average sleep disturbance rates, while events noisier than this gave a mean probability of disturbance of about 1 in 75, with a range of individual sensitivities around this average. Subsequent government sponsored research resulted in three reports concerning aircraft noise and sleep:

"Adverse Effects of Night-Time Aircraft Noise", CAA, March 2000;

"Aircraft Noise and Sleep 1999 UK Trial Methodology Study", Ian Flindell et al, November 2000;

"Perceptions of Aircraft Noise, Sleep and Health", Ian Diamond et al, December 2000.

Having considered these reports the Government decided - in 2001 - to commission a major new study that would concentrate on subjective responses to annoyance to aircraft noise. This study is reassessing attitudes to aircraft noise - including re-assessment of the association between the Leq index and reported annoyance - as well as attempting to examine subjective valuation of the nuisance from aircraft noise. It is due to report later this year.

The "Future of Air Transport" also sets out the impact of the Government's policies on air quality standards around airports, with further information contained in one of the supporting documents, "Air Quality Assessments Supporting the Government's White Paper". Although on a national scale the contribution of air transport and associated activities to local air quality problems are small, locally their effect can be significant. This is especially so at Heathrow and the reason why the Department has set up technical panels to review air quality issues at the airport as part of the Project for the Sustainable Development of Heathrow.

Copies of reports referred to are available in the House Library and many can be accessed electronically on the Department's website at www.dft.gov.uk.

24 January 2006: Road improvements

Shona McIsaac: To ask the Secretary of State for Transport pursuant to the answer of 16 January 2006 if he will clarify the information given in relation to road improvement in North East Lincolnshire, with particular reference to low noise resurfacing on the A180 east of Ulceby towards Grimsby.

Dr Ladyman: My answer of 16 January confirmed the programmed dates for the low noise carriageway resurfacing of the remaining sections of the A180 in north-east Lincolnshire. The Highways Agency's policy for carriageway resurfacing is developed on a whole life cost basis, identifying the appropriate maintenance treatment at the optimum time and using quieter surfacing materials.

The current Government Spending Review 2004 confirms the Highways Agency's budgets for the period 2005-06 to 2007-08; no indication is available of funding levels beyond this period. Consequently, as the programmed dates for the works concerned fall outside the current Spending Review period, the allocation of funding to these resurfacing schemes cannot be confirmed at this time.

30 January 2006: Bottle-nosed whale

Mr Scott: To ask the Secretary of State for Defence

what assessment he has made of whether the bottle-nosed whale calf which died during the attempted rescue on 21 January was forced up the Thames by (a) sonar from a naval vessel or (b) explosions at Shoeburyness.

Mr Ingram: No Royal Navy ships were operating military sonar in the area of the Thames estuary or the North Sea on 21 January 2006 or in the days immediately preceding 21 January 2006.

An independent company specialising in noise and vibration monitoring has advised that the impact of Ministry of Defence activities at Shoeburyness on the marine environment at Shoeburyness is miniscule compared to the impact of everyday shipping in the area. We have no evidence to suggest that our use of Shoeburyness forced the whale up the Thames.

6 February 2006: Sonic boom technology

Lynne Featherstone: To ask the Secretary of State for Defence whether any naval vessels equipped with underwater sonic boom radar technology were operating in the vicinity of the Thames estuary or mouth on 19 and 20 January, and what assessment he has made of the effect of sonic boom technology on marine wildlife.

Mr Ingram: No Royal Navy vessels were using military sonar in the vicinity of the Thames estuary or the mouth of the Thames on either 19 or 20 January this year. The Ministry of Defence (MOD) takes its responsibilities for the environment very seriously. However, there continues to be a vital requirement for the United Kingdom to maintain a maritime capability to protect crucial lines of communication, to participate in operational activities and to be able to address potential mine and submarine threats, now and in the future. To ensure that our military capabilities in these areas are fully maintained, it is imperative that we continue to use active sonar, both now and in the foreseeable future. Furthermore, sonar is essential to protect UK waters and ensure safe navigation. That said, this certainly does not imply that our sonar activities are undertaken without the fullest possible respect for the environment.

Environmental impact assessments (EIAs) are undertaken for a wide range of our activities in the marine environment, including sonar. Such EIAs cover the marine habitat of the operating area concerned and the species likely to be encountered. The EIAs are used to better tailor the activity and ensure that potentially damaging effects are identified during the planning stage of the exercise and reduced their impact to an absolute minimum. With the same aim in view, we have also issued instructions to all our ships' Commanding Officers for the operational use of sonar in the marine environment. This guidance employs the precautionary principle of "plan, look, listen and act".

While we believe that our operating procedures reflect the best scientific advice and provide a sustainable balance between the need for effective military training and the need to protect our marine environment, we are certainly not complacent. The MOD continues to be closely involved in research, in the UK, with the US and NATO authorities, and in other international forums into the possible effects of sonar noise on marine life. Should any new research provide evidence of a link between our method of using sonar and a detrimental effect on marine life, we would, of course, consider what further mitigation measures might be possible. In the meantime, the current measures reflect the best

scientific advice available.

Licensing Act

Mrs Spelman: To ask the Secretary of State for Culture, Media and Sport what research the Government have (a) conducted and (b) commissioned on the effect on noise of the Licensing Act 2003.

James Purnell: A report entitled "Implications for noise disturbance arising from liberalisation of Licensing Laws" was produced for the Department for Environment, Food and Rural Affairs by MCM Research Ltd and published in October 2003. The principal aim of the study was to assess the potential impacts of the reform of the licensing laws on noise disturbance related, directly or indirectly, to the operation of licensed premises.

The report is accessible on:

www.defra.gov.uk/environment/noise/research/mcm/index.htm

It is too early to assess the impact of the Licensing Act 2003 on noise, and so the Government have not conducted or commissioned any formal research. However, any issues around noise are likely to emerge from the Scrutiny Council process. We are working closely with a sample of local authorities to monitor delivery of the 2003 Act and assess the extent to which strategic aims are being achieved. This in turn is part of a wider monitoring and evaluation exercise to assess the practical implementation of the Act.

7 February 2006:

Air traffic (noise and pollution)

Lynne Featherstone: To ask the Secretary of State for Transport what alternatives to runway alteration he will propose to provide respite from air traffic noise and pollution; and if he will make a statement.

Ms Buck: Options for introducing mixed mode at Heathrow are still being developed. There will be public consultation on any proposals and this will address the implications for runway alternation, as currently operated, and any mitigation measures.

8 February 2006: M180

Mr Greg Knight: To ask the Secretary of State for Transport for what reasons over six miles of the M180 motorway has the outside lane closed in both directions; why the maintenance work being carried out was not restricted to a shorter stretch to avoid congestion; and if he will make a statement.

Dr Ladyman: A nine mile stretch of the M180 between junctions 3 and 4 has lane closures, a contra-flow and a 50 mph speed limit in place in both directions to carry out essential safety improvements. These improvements include low noise resurfacing, installation of a new concrete central reserve barrier and to carry out drainage and maintenance work. The Highways Agency is undertaking the works as one scheme to reduce its duration on site, thereby minimising disruption and risk to the road user, as well as making it safer for road workers. It also provides better value for money, as it is less expensive than a number of smaller schemes. Traffic flows have been monitored since the scheme commenced on 16 January and delays of no more than 10 minutes have been experienced at the busiest times.

9 February 2006: Heathrow noise review

Alan Keen: To ask the Secretary of State for Transport what account his Department took of

the potential impact of the Review of the British Airports Authority Heathrow Noise Fines Fund in preparation of the Civil Aviation Bill; what discussions his Department has had with the review team; what assessment he has made of its terms of reference; when he expects it to report; and whether his Department plans to respond to its findings.

Ms Buck: The BAA Heathrow Noise Fines Fund is a matter for the airport operator concerned. The Department is aware that BAA is reviewing this fund, but has not discussed it with the review team or made any assessment of the review's terms of reference.

14 February 2006: Calls to prayer

Mr Gordon Prentice: To ask the Secretary of State for Environment, Food and Rural Affairs what guidance she gives local authorities on the acceptable volume of amplified calls to prayer; and if she will make a statement.

Mr Bradshaw: Complaints about noise from amplified calls to prayer can be addressed by local authorities under the statutory nuisance provisions of the Environmental Protection Act 1990. It is for the appropriate local authority to determine whether a noise amounts to a statutory nuisance. The Department does not produce guidance on acceptable levels of noise, since these will vary. Factors to be taken into account include the character of the locality, the duration of the noise and the frequency of its occurrence.

Aircraft noise

Adam Afriyie: To ask the Secretary of State for Transport (1) what definition of excessive noise his Department uses in documents relating to (a) the noise from aircraft and (b) other civil aviation matters; (2) pursuant to his Department's consultation on night flying restrictions, how he plans to measure the effectiveness of the proposals to bear down on noise.

Ms Buck: We have stated in consulting on our proposals for night flying restrictions at Heathrow, Gatwick and Stansted that one of our broad aims is "to strike a fair balance between the protection of local communities from excessive aircraft noise levels at night and the provision of air services at night where they are of benefit to the national, regional or local economy". The expression 'excessive noise' does not apply to a specific level of aircraft noise: what is excessive will vary according to locations and individuals.

Based on research, the Government use various measurements of aircraft noise as indicators of disturbance or of potential annoyance, or as criteria for mitigation measures, including advice for land use planning purposes. 'Bearing down' on night noise from aircraft arriving at or departing from Heathrow, Gatwick and Stansted is expressed by the new proposed environmental and night noise abatement objectives for the airport on which we invited comments as part of the consultation on night flying restrictions.

The final objectives will be announced as part of the decision on future night flying restrictions. The way in which their effect in practice will be assessed will depend on what the objectives are.

Standards Update

Environmental and industrial acoustics

New Standards

BS EN 60118-13:2005	Electroacoustics. Hearing aids. Electromagnetic compatibility (EMC)
BS EN 60704-2:2005	Households and similar electrical appliances. Test code for the determination of airborne acoustical noise. Particular requirements for electric thermal storage room heaters
BS EN ISO 17201-1:2005	Acoustics. Noise from shooting ranges. Determination of muzzle blast by measurement
BS EN ISO 8041:2005	Human response to vibration. Measuring instrumentation
BS EN ISO 14837-1:2005	Mechanical vibration. Ground-borne noise and vibration arising from rail systems. General guidance
BS EN ISO 14963:2003	Mechanical vibration and shock. Guidelines for dynamic tests and investigations on bridges and viaducts
BS EN ISO 16063-22:2005	Methods for the calibration of vibration and shock transducers. Shock calibration by comparison with a reference transducer
BS EN ISO 18437-3:2005	Mechanical vibration and shock. Characterisation of the dynamic mechanical properties of viscoelastic materials. Cantilever shear beam method

Draft Standards For Comment

05/30063285 DC	EN 352-8 Hearing protectors. Safety requirements and testing. Part 8 entertainment audio earmuffs
05/30064424 DC	ISO 10846-5 Acoustics and vibration. Laboratory measurement of vibro-acoustic transfer properties of resilient elements. Part 5 Low frequency dynamic stiffness of elastic supports for translatory motion (driving point method)
05/30094854 DC	ISO 3746 Acoustics. Determination of sound power levels and sound energy levels of noise sources using sound pressure. Survey method using an enveloping measurement over a reflecting plane
05/30096155 DC	BS 9142 Assessment methods for environmental noise. Guide
05/30098127 DC	ISO 10846-1 Acoustics and vibration. Laboratory measurement of vibro-acoustic transfer properties of resilient elements. Part 1 principles and guidelines
05/30103114 DC	ISO 10846-1 Acoustics and vibration. Laboratory measurement of vibro-acoustic transfer properties of resilient elements. Part 2 dynamic stiffness of elastic supports for translatory motion (direct method)
05/30138982 DC	EN 12102 Air conditioners, liquid chilling packages, heat pumps and dehumidifiers with electrically driven compressors for space heating and cooling. Measurement of airborne noise. Determination of the sound power level
05/30141146 DC	IEC 61161 ED 2 Ultrasonics. Power measurement. Radiation force balances and performance requirements up to 1W in the frequency range 0.5MHz to 25MHz and up to 20W in the frequency range 0.75MHz to 5MHz
05/30143389 DC	ISO 21289 Mechanical vibration and shock. Parameters to be specified for the acquisition of vibration data
05/30143701 DC	ISO 2017-2 Mechanical vibration and shock. Resilient mounting systems. Part 2 Technical information to be exchanged for the application of vibration isolation associated with railway systems

Withdrawn Standards

BS EN 60118-13:1998, IEC 60118-13:1997	Hearing aids. Electromagnetic compatibility (EMC). Product standard
BS ISO 9921-1:1996	Ergonomic assessment of speech communication. Speech interference level and communication distances for persons with normal hearing capacity in direct communication (SIL method)
BS 6955-4:1994, ISO 5347-4:1993	Calibration of vibration and shock pick-ups. Method for secondary shock calibration
BS EN 60118-13:2005	Instrumentation for the measurement of vibration exposure of human beings. Specification for general requirements for instrumentation for measuring the vibration applied to human beings, transmitted to the hand and exposure to the whole body
DD ENV 28041:1993, ISO 8041:1990	Human response to vibration. Measuring instrumentation

Environmental Protection: Noise And Nuisance

Research Newsletter 2006/2007 | Issue 1 - February 2006

The Secretary of State for Environment, Food & Rural Affairs, has recently issued the above document. This can be obtained from the Department's website:

<http://www.defra.gov.uk/environment/noise/research/index.htm>

Any member interested in submitting

Expressions of Interest for any of the projects listed in the above mentioned document, should note that they must be received in the Department by close of play 10 March 2006 (Defra will accept late submissions for any project not tendered at the time of receipt). Expressions of Interest must be submitted on the SID2 FORM available from the

Department's website:

<http://www.defra.gov.uk/science/funding/forms.htm>

For any further information on the projects or general enquires about the process, the appropriate personnel listed at the end of the document should be contacted.

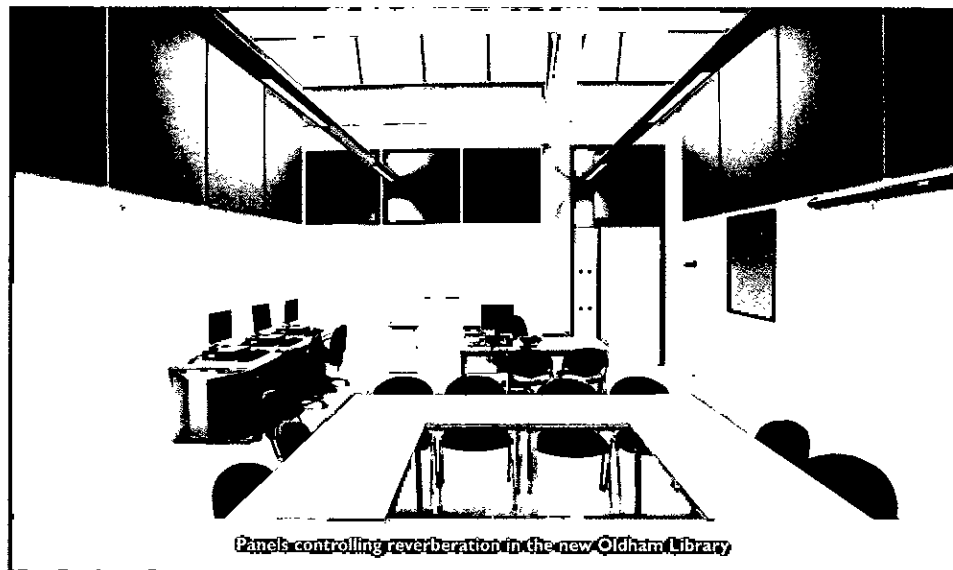
Shush At Oldham Library

Kier North West

Kier North West has selected SuperPhon Acoustic Wall Panels to create a sound dampening interior for its new Oldham Library and Lifelong Learning Centre project. CMS Acoustic Solutions recommended the panels, which are acoustically absorbent and offer a high quality decorative finish.

SuperPhon acoustic wall panels reduce noise both by impeding sound transmission through an element of the structure, and by absorbing sound at the surface. The panels complement design concepts with an aesthetic fabric covering which is easy to clean and maintain.

Tony Harrison, project manager of Kier North West, commented that there were many acoustic solution providers to choose from, but the challenge was finding a product that delivered the required performance. CMS Acoustics was able to recommend a product which exceeded the



Panels controlling reverberation in the new Oldham Library

requirements and expectations. SuperPhon was almost half the cost of what the architect had previously specified, while achieving high performance levels. The product is ideal for application in studios, conference centres, cinemas and other areas where an effective means of controlling reverberation time and reflected sound, combined with an

aesthetically pleasing appearance, is required. It is a fully bespoke product, and is made to order on a site-by-site basis for new build, refurbishment and post-build projects. The standard covering is an acoustically transparent woven textile fabric.

Web site: www.cmsacoustics.co.uk

Tel: 01925 577711

EuroNoise 2006 Congress

Tampere, Finland

Euronoise 2006, the 6th European Congress on Noise Control, will take place on 30 May to 1 June 2006 at Tampere Hall, the excellent congress centre in Tampere, Finland.

The theme is Advanced Solutions for Noise Control and the Congress is being organised by the European Acoustics Association, the Acoustical Society of Finland and VTT Technical Research Centre of Finland.

The final date for the submission of contributed papers is approaching and prospective authors are invited to submit abstracts to the organising committee. Information on the planned structure of the Congress can be found on the web site <http://www.euronoise2006.org>

Four plenary lectures have been confirmed:

- EU Environmental Noise Policy: Progress and Outlook (David Delcampe)
- Advanced Materials and Structures for Noise Control (Peter Göransson)
- The Neural Base of Noise Annoyance (Jukka Ylikoski)
- Advanced Procedures for Psychoacoustic Noise Evaluation (Hugo Fastl)

In addition to technical sessions, workshops in various fields of noise control are planned. For example, an important workshop on Noise Policy will take place covering topics from environmental noise to product and occupational noise. More information on workshops and other events is given on the website.

The Tampere Hall offers excellent exhibition facilities and companies are invited to

promote their products during the Congress; spaces are now being reserved.

Technical visits allied to the Congress will include a tour of the NOKIA Wireless Future Lab to provide a vision of the communication business of the future.

The social events will enable the attendees to enjoy the beautiful Finnish summer evenings. On the Tuesday the Congress attendees are invited to a city reception at the newly renovated Old City Hall, located at the Central Square, in the centre of Tampere. This is to be followed by a Finnish evening on Viikinsaari Island located within a half an hour boat trip distance from Tampere.

Regularly updated information can be found at <http://www.euronoise2006.org>

Noise Action Week

22-26 May 2006

Noise Action Week (NAW) is a national annual initiative to promote practical solutions to everyday noise problems, focussing on neighbour and neighbourhood noise. It is co-ordinated by NSCA, the environmental protection charity. The Week is supported by noise management professionals across the UK - including local authority officers, housing managers and noise consultants. The IOA will be supporting Noise Action Week 2006 by holding a meeting on Developments in Noise Research on 23 May. The NSCA would like to encourage wider involvement of IOA members, who can use the week as an opportunity to promote the science and profession of acoustics, and the importance of acousticians in managing our everyday soundscapes. This can be achieved by:

- loaning/demonstrating noise monitoring equipment to organisations taking part - mainly local authority noise and housing services
- offering to work with local schools - either independently or in partnership with local environmental protection officers, to increase education about noise

Or any other way you can think of! This year a MORI poll on neighbour noise is being undertaken, for publication to promote Noise Action Week. The initiative always receives widespread press and radio coverage at local level, and it is hoped for wider national coverage this year. This is your chance to be part of a major initiative to highlight the crucial role acousticians can play in ensuring an acceptable quality of life for all. To find out more go to:

<http://www.noiseactionweek.org.uk>

First Australasian Acoustical Societies' Conference

Noise of progress

The Australasian Acoustical Societies' Conference will be held on 20-22 November 2006 at Clearwater Resort, Christchurch, New Zealand

Technical contributions to the conference on all acoustical issues are invited, in particular those addressing the following topics:

- Community response to noise
- Transportation noise
- Building acoustics codes and standards
- Underwater acoustics
- Automotive noise and vibration
- Psychoacoustics and physiological acoustics
- Room acoustics and sound systems

Abstracts of up to 200 words should be forwarded to:
acoustics@conference.co.nz by **31 March 2006**

Interest can be registered online or by contacting Barry Woodland, Conference project manager, Conference Innovators Ltd by phone: +64 3 379 0390, or e-mail: barry@conference.co.nz

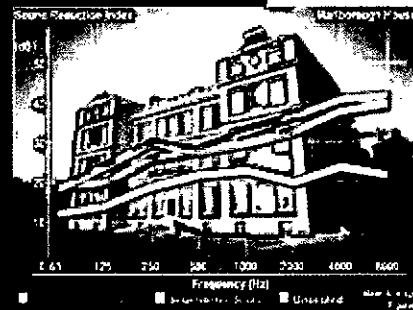
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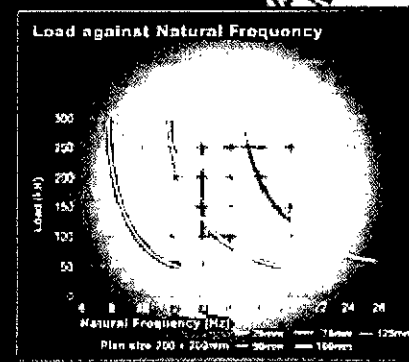
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A Life In The Day Of Oceans

Oceans07 Conference & Exhibition

Today, as any other day, our oceans are used as the dominant method for transporting goods, providing fish as a major food source, and extracting oil and gas as our principal source of energy. Marine activities are also used to implement our global communications and island defence policies. Moreover, an increase in leisure time means that the use of coastal waters for recreation activities continues to expand and our climate depends on patterns of ocean circulation.

It is without doubt that our oceans present a complex and diverse environment providing us with a vast resource which plays a major role and impacts on all our lives. Indeed, on a planet with over 70% of its surface covered with water and ever-diminishing resources, our use of the oceans will inevitably lead to conflicts of interest.

A number of the world's leading scientists have said that on a global level, human activities have and will continue to have an impact on conservation of the ocean resources and economic viability. From coastline to deep sea the oceans provide our marine, subsea, and oceanic engineers with many challenges in their drive to understand the complexities of the world's oceans, and all that this diverse environment holds for us.

Oceans07 is a major international event and is being run under the auspices of the Oceanic Engineering Society (OES) and its parent organisation The Institute of Electrical and Electronic Engineers (IEEE). The Institute of Acoustics is a technical co-sponsor of the conference. The prestigious "Oceans" conference and exhibition is being held in association with The University of Aberdeen with major support from Aberdeen City Council, Shell, and the

Office of Naval Research. This is the first time that this event has been held in the UK and only the second time in Europe.

Whilst exploiting the oceans' resources it enables us to foster their protection in a sustainable manner. As part of this process, Oceans07 further aims to bring together the more experienced players with the new and developing young skills to foster the continuing allure, exploitation, and necessary protection of this environment.

The long-established worldwide pedigree of Oceans will make Aberdeen the focus for many leading international industrialists and academics in 2007 and our remit is to promote and disseminate knowledge, understanding and awareness of all the engineering, science, and technology of the oceans and its impact on our lives and environment.

"Marine Challenges: Coastline to Deep Sea" is the theme and will highlight the significant challenges facing marine, subsea, and oceanic engineers in their drive to understand the complexities of the world's oceans, and all that this diverse environment holds for us. These challenges start from the shallowest waters around our coastlines and stretch to the deepest subsea trenches and cover not only science, technology and subsea exploration, but also preservation and sustainability, extraction and protection of resources (mineral and natural), policy and education, and finance and funding.

A programme of plenary and keynote lectures by speakers of international standing will address the "Challenges" theme, which will be further underpinned by a wide-ranging technical programme and exhibition. We invite the world's marine policy makers, ocean scientists, subsea engineers, and technologists to come to Aberdeen, Scotland on 18-21 June 2007 to discuss the challenges for the future.

We promise to give you a traditional Scottish welcome that will leave you wanting more.

www.oceans07ieeeaberndeen.org

Sound Performance In The Studio

Selectaglaze Ltd.

In radio broadcasting it does not make for good listening if the presenter is being drowned out by passing traffic or chatter from the control room. So, when it was decided to create new studios in BBC Radio 2's central London headquarters inside the imposing but acoustically-exposed art deco Western House, the challenge was twofold: to create a state-of-the-art open studio environment and at the same time preserve the superb, predominantly glazed, period facade.

A further challenge came from the impact of demolition and building work only yards from the building's perimeter; all part of the wider BBC New Broadcasting House development in London's West End which will create a cutting-edge broadcast centre for BBC network Radio and for BBC News/BBC World Service.

The solution devised by architects LandSecurities Trillium and consultants Tony Woolf Acoustics involved the construction of a 1m wide service corridor between the studios and the perimeter wall with studio windows being positioned to align with existing external windows and so maintain views to the outside world. A specific client requirement was to provide studios with an interesting open environment with views throughout this accommodation.

Secondary glazing specialist Selectaglaze Ltd was invited to design and manufacture a range of secondary windows and observation panels to meet the necessary sound criteria and the large areas of glazing.

The external windows were treated with Selectaglaze's Series 40 double hinged casements featuring 6.8mm acoustic laminate glass and fitted with high performance compression seals. The studio wall windows were set in pairs, using fixed panes angled at 7° and glazed with 10.8mm and 6.8mm acoustic laminate glass, making a total of four layers of glazing between the studio and the outside. Fabric covered sound absorbent linings were fitted to the reveals between each pair of studio windows.

The internal windows between the main studios and support areas were specifically designed to create a dramatic effect by providing the maximum amount of clear vision. The Series 40 fixed panes were set in pairs, angled at 5° and glazed with 10.8mm Amiran anti-reflective Optiwhite acoustic laminate



Western House observation window

glass from Schott. The largest of these panels was almost 3m long.

In total, Selectaglaze provided 62 double hinged casements to the perimeter windows and over 100 fixed panels to the studios.

The eight-month project presented a number of technical and operational challenges because of the extremely tight design for each floor and the difficulties associated with working with such large panels of glass. It was successfully completed on time and has fully met the BBC's very exacting sound index criteria.

The benefits of secondary glazing systems are not only in sound insulation: they also offer high levels of thermal insulation and can be specified to include Part L compliant sealed units. Selectaglaze has also recently developed a suite of security units, providing protection against bomb blast and physical attack.

Secondary glazing systems are purpose-made and come fully assembled to allow rapid installation with minimum disruption. They need very little maintenance and continuously contribute to energy saving.

Wherever possible, the units are independently tested and certified so that clients know they can rely upon the quality and assurances of the products and the company itself. A full range of product literature and technical specifications is available on request. The company also offers RIBA approved CPD training (now available online) which is designed to help architects and specifiers identify the need for secondary glazing and to understand where, why and how it should be used.

For more information visit www.selectaglaze.co.uk

SLR Consulting

Acoustic team expands to meet demand

Environmental Consultancy SLR has expanded its acoustics team to provide a greater resource for this expanding field of work.

Joining as a senior acoustics consultant, based in the Oxford office, Louise Beamish brings expertise in acoustic impact assessments for the property and transport infrastructure sectors.

Project acoustic consultant Pamela Williams joins the team in the Redditch office, further expanding SLR's capability in the environmental acoustics field.

Team leader Mike Brownstone said that the new appointments ensured the firm was better placed to meet the growing demand for expert services in acoustics. The team would continue to provide advice to the minerals and waste sectors while expanding its presence in the property and transport sectors.

Louise previously worked at various environmental consultancies, dealing with environment noise and building acoustics after graduating from Luton University in 1999 with a degree in media technology.



Louise Beamish

Mike Brownstone

Pamela, who has a degree in environmental engineering, previously worked for mechanical engineering and environmental consultancy Zisman Bowyer and Partners, where she spent three years.

SLR Consulting has eight offices in the UK with over 250 specialist environmental consultants, offering advice on waste property development, renewable energy, oil, gas, minerals, professional and legal support.

SLR group web site: www.slrconsulting.co.uk

The Institute Diploma Examination 2005

Prof K Attenborough FIOA.

The numbers of candidates gaining Merits (M), Passes (P) or Fails (F) in each Module are shown for each Centre in the Table of Results. This includes the results of appeals. Note that the Fail grade numbers include those who were absent from the written examinations. This year 135 candidates entered for the General Principles of Acoustics (GPA) written paper (140 entered in 2004, 121 entered in 2003, 154 entered in 2002, 129 entered in 2001, 150 entered in 2000 and 183 entered in 1999). 10 candidates were absent. There were 94 candidates for Law & Administration (L&A), 98 for Noise Control Engineering (NCE), 56 for Architectural and Building Acoustics (ABA), 42 for Transportation Noise (TN), 10 for Vibration Control (VC), 5 for Sound Reproduction (SR) and 4 for Measurement (M). Candidates who have not submitted their project reports are shown as failed in the Table.

The mean marks for the GPA this year are comparable with previous years. DL (Scotland) candidates did relatively well overall. These candidates also did very well in the ABA Module. For the second successive year, the numbers of Fails on the GPA were particularly high at Leeds. Questions 5 and 6 on vibration levels and accelerometers were least popular.

As in the previous two years, a merit threshold of 70% was applied to the written paper and the conflated GPA mark. The examination scripts of candidates satisfying the conflated mark threshold but gaining between 67% and 69% on the written paper were examined at moderation, re-marked where appropriate, and judged individually as 'pass' or 'merit'. However, even if these criteria were satisfied, a merit was not awarded if the assignment mark was carried over from a previous year.

As a result of the coursework moderation process introduced in 2003, three examples of assignments corresponding to 'fail', 'moderate' and 'merit' marks were provided by each Centre for the moderation meeting. The clear discrepancy between mean CW and mean written paper marks for NCE and the resultant prospect of failing some students, who had achieved quite respectable examination marks, because of their CW marks lead to the proposal at moderation that the CW marks be raised by 5%. It should be noted that a similar situation in 2004 led to a 15% increase in raw CW marks. As last year, the mean CW mark for ABA was significantly higher than those for other SMs so all CW marks for ABA were reduced by 13% at moderation.

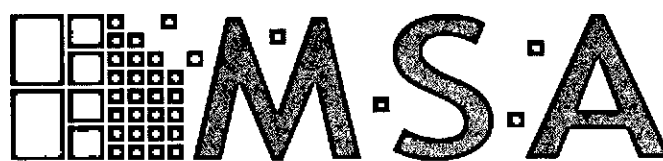
As in the last two years, the mean coursework marks for three of the Specialist Modules were less than the corresponding mean written examination marks. For a Merit grade, candidates were required either to have a conflated mark of at least 75% plus a mark of at least 70% in exam or a mark of at least 70% in exam and a mark in the upper quartile in the relevant assignment. No merit was awarded if it depended on a deferred score.

Grades awarded to Diploma candidates in 2005

CENTRE	GRADE	GPA	ABA	L&A	NCE	TN	VC	Meas	SR	Project
NESCOT	M	2	2	1	3	2	0	0	0	2
	P	21	6	12	14	5	0	0	0	21
	F	2	3	2	4	2	0	0	0	4
Leeds (LMU)	M	2	2	1	1	0	0	0	0	3
	P	7	4	8	8	0	0	0	0	7
	F	8	4	3	4	0	0	0	0	7
Derby	M	3	4	2	1	0	0	0	0	3
	P	19	4	13	11	15	0	0	0	20
	F	10	3	7	2	6	0	0	0	10
Colchester	M	2	0	1	1	0	0	0	0	2
	P	12	0	10	14	0	4	0	0	13
	F	2	0	3	3	0	2	0	0	2
UWE (Bristol)	M	0	1	3	2	0	0	0	0	1
	P	2	0	5	6	1	0	0	0	6
	F	3	0	1	1	0	0	0	0	1
Salford	M	3	8	0	3	1	0	0	0	2
	P	9	2	5	5	4	0	0	0	13
	F	6	1	2	2	1	0	0	0	3
Ulster	M	0	0	0	0	0	0	0	0	0
	P	0	0	0	0	0	0	0	0	1
	F	0	0	0	2	0	0	0	0	0
Distance learning (St Albans)	M	4	3	1	0	0	0	0	1	2
	P	4	2	3	6	2	1	1	0	5
	F	5	2	1	4	0	0	1	1	5
Distance learning (Edinburgh)	M	4	2	0	0	2	1	0	0	0
	P	4	4	1	6	1	0	0	1	6
	F	0	0	0	0	0	0	1	0	3
Distance learning (Bristol)*	M	3	2	0	2	0	0	0	0	0
	P	7	5	2	6	0	2*	0	2*	8
	F	1	0	2	1	1	0	1*	0	5

*includes DL New Zealand student

The IOA Diploma prize for best overall performance (4 merits including project and the highest average mark on the written papers) has been awarded to Simon M. Faircloth (Salford). Three other Diploma candidates [Laurence D. Evans (NESCOT), Richard J. Palmer (NESCOT) and Debbie L. M. Raynor (Derby)] also achieved 4 merits including Project and have received Special Commendation Letters. Special commendations for achieving 3 Merits (and a Pass), have been sent to seven others [Alexandra M. Bulleid (Bristol), Matthew K. E. Burdett (DL), Robert A. Chilton (DL), Robert M. Evans (Derby), Innes E. Johnston (DL), Peter F. McMillan (Salford) and Gary D. Peskett (DL)].



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☐ **Principal Consultant - Bristol - Excellent package on offer**

Ref : IOA223

Renowned consultancy are looking for an ambitious and dynamic individual to oversee their new Bristol office. Applicants should have a minimum of 8 years consultancy experience, possess an excellent knowledge of architectural and environmental acoustics and be a full member of the IOA. If you feel unfulfilled or have reached a ceiling in your current role and have the drive to expand this already successful business, this is the role for you.

☐ **Acoustic & Noise Consultants - London - Up to £20-30k**

Ref : IOA165

Rapidly expanding consultancy seeking Acoustic Consultants with a minimum of 12 months' consultancy experience to work and train on a wide variety of exciting projects. Genuine long-term career development and progression. Applicants should also have a relevant degree and a full driving licence.

☐ **Noise, Vibration & Acoustics Consultants - East Midlands & North West**

Ref : IOA941

Multi-disciplinary Consultancy keen to appoint acoustics professionals with experience of environmental and/or building acoustics to join our existing team in delivering a quality service to both existing and new clients. Successful applicants will have a minimum of 2 years post-graduate relevant experience, ability to liaise with clients at all levels and write technical reports. A suitable degree and post graduate diploma in acoustics and noise control are essential.

☐ **Architectural & Environmental Acousticians - Glasgow & Edinburgh**

Ref : IOA301

We have positions for specialists in both Building Acoustics, and Environmental Planning & Noise. *Building Acousticians* should possess 3 years experience in architectural acoustics consultancy with the ability to give technically sound & practical advice on a wide range of building projects. You must be able to work within a & lead in managing the acoustic design of important projects with some of the world's greatest architects - an understanding of Electro acoustics and audio-visual consultancies would be advantageous. *Noise & Vibration consultants* are required at Junior & Senior level whose previous experience should have a strong emphasis on renewable energy projects, particularly on-shore windfarms.

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List Of Diploma Project Titles 2005

UNIVERSITY OF WEST OF ENGLAND

- Road surface noise – a comparison of three road surfaces
- Comparison of measured and calculated attenuation of a barrier
- Investigation of attenuation of sound from a wind farm
- The acoustics of Exeter Guildhall
- Plasterboard sound attenuation
- The effects of small gaps on the sound insulation of smoke alarms
- Assessment of the acoustic specification of smoke alarms

UNIVERSITY OF DERBY

- Sources of vehicle noise and noise levels received by drivers
- Comparison of road traffic noise and air quality
- Noise at drag-racing events
- Prediction of external noise from enclosed industrial sources
- Noise impact from a proposed wind farm development
- Control of Noise at Work Regulations 2005
- Directional characteristics of two types of reversing alarms
- Headphone sound levels in a TV studio environment
- Audibility of train warning horns
- Directivity of exhaust ducts on gas turbine packages
- Cinema wall design
- Sound levels from garden equipment
- Noise at work assessment of refuse collectors
- Selection of suitable venues and stage positions for outdoor music events
- Critical evaluation of BS.4142
- Reliability of human aural recognition of low frequency noise
- Noise exposure levels of bar staff
- Impact of traffic calming measures
- Variation on results from site testing
- Comparison of vehicle noise levels for road surfaces
- Sound intensity techniques applied in National Grid substations
- Conflicts and synergies in application of various Noise Rating criteria to mechanical plant
- Noise levels of films in cinemas and risk to hearing

COLCHESTER INSTITUTE

- Investigation into noise from commercial freezer
- A study of sound insulation
- Agricultural fan attenuation with rural materials
- Effectiveness of sound insulation between properties
- Noise control in marquees
- Acoustic performance of bell tower shuttering
- Noise from pub function room
- Enclosures: insulation versus absorption
- Environmental noise impact of air extraction system
- Vehicle noise and its perception from the use of speed bumps
- Noise mapping comparison of actual and theoretical levels
- Noise impact assessment of proposed relocation of a steel fabrication company
- Assessment of noise from a motocross event
- Building vibration ((road traffic on adjacent flyover)
- Internal noise level of traveling vehicle re: NAV Regulations

LEEDS UNIVERSITY

- Whole body vibrations and off-road motor cycle use
- Impact noise and hard floor finishes
- Acoustics of Doncaster Minster
- Noise in a crisp factory
- The noise climate of local nature reserves
- Hand-arm vibration from road working machinery
- Noise from the Carling Leeds Festival
- Noise from Robin Hood Airport
- Noise from a combined heat and power unit
- Whole body vibration in pest control officers

NESCOT

- Control of entertainment noise from marquee events
- An objective assessment of noise levels in an open plan office
- Studying the effect of traffic calming in Essex on road traffic noise
- A comparison of guides by CIEH v surveyed local authorities on clay

- pigeon shooting
- Interview rooms – a right to privacy
- Attenuation properties of windows to restrict external noise
- Environmental impact of train horn noise
- Use of NR curves as a tool in support of statutory noise nuisance cases
- Review of BS4142 through reassessment
- Effectiveness of noise control measures in a print workshop
- An investigation into the effectiveness of a motorway noise barrier
- A study of city centre traffic noise affecting tall buildings
- An investigation into the effects of wet road/tyre noise
- Prediction of reverberation times within school sports hall
- Assessment of noise from late night vehicle deliveries
- Noise control in an open plan office
- The effect of silencers on the noise created by light aircraft
- Investigation into attenuation levels of MK4 helmets and measurement procedures
- Assessment of low frequency noise from buses and associated health effects
- Assessment of absorption coefficient for different types of foam
- Comparison of predicted and measured noise levels from an offshore oil rig
- Variation in ambient noise levels in Fulham Broadway

SALFORD UNIVERSITY

- Entertainment noise from a British Legion club
- Noise from a drive-through fast food outlet
- Acoustics and ventilation in schools
- Noise levels in a hair salon
- Relationship between impact sound insulation and work of compression of resilient flooring materials
- Investigation of the acoustic isolation of a roof mounted air handling unit
- Control of noise from pubs and clubs
- Noise impact of a motorcycle speedway on existing and proposed dwellings
- Design application and absorption of molded absorbers with perforated aluminum face
- Evaluation of hand-arm vibration exposure of grounds maintenance staff
- Noise from the new Manchester City Football Stadium during rock concerts
- Assessment of noise from a rail container freight terminal
- Noise control through IPPC
- The noise impact of a car racing track in a rural location
- Application of the Noise Insulation Regulations near to a motorway and the effectiveness of a noise barrier

ULSTER

- An investigation in the effect of age and structured deterioration on cab noise attenuation

DISTANCE LEARNING

- Effect of noise levels in cars on speech intelligibility
- Effect of panel absorption of varying the air gap
- Analysis of factors affecting efficiency of double glazing insulation
- Noise control techniques applied to a warehouse pallet truck
- Evaluation of the attenuation of sound offered by an open window
- Assessment of insertion loss of various materials
- Statistical parameters and night time noise assessments
- Noise Impact of events held at a sports stadium
- Temporary threshold shift noise induced hearing loss in sound recording engineers and their combined effect on recorded music quality
- An investigation into open window attenuation
- NR assessment for a proposed waste water treatment works
- Noise levels from road traffic passing over a level crossing
- Noise from an underground car park
- Sound transmission from outside to inside
- Validation of duct-borne services noise prediction software
- Investigation into MP3 recording for use in acoustic measurement
- Study of the CRTN shortened measurement procedure
- Improvement of impact sound insulation of a concrete and timber joist base floor with four floor coverings
- The use of STIPA to assess speech intelligibility in school classrooms
- Gt Klee's technique for attenuating fluid borne noise in an automotive PAS system
- A review of development of UK Building Regulations for sound insulation between attached new-build dwelling

Errors & Omissions

In line with quality newspaper practice, it is the policy of Acoustics Bulletin to correct any errors and omissions as soon as they occur. The January/February issue, Volume 31 no.1, had more than its fair share of 'bloopers', for which we apologise unreservedly.

In the report on RS21 (pp.21 and 22) Peter Mapp's name was inadvertently transmogrified to Malpas, thus causing potential embarrassment to both parties. We apologise for the confusion.

The letter from John Houldsworth on p.45 was edited with more gusto than is quite seemly, as readers familiar with BB93 may have realised. Those of us who are less well read will have been left completely fuddled by the reference to 'primary' in the 'above note' when there was no such word anywhere to be seen. The missing words, in context, were those of the first footnote to Section 1 of BB93:

'The primary professional body for acoustics in the UK is the Institute of

Acoustics (www.ioa.org.uk). An experienced professional acoustician who is competent to be responsible for the acoustic design of school buildings would normally be a corporate member of the Institute of Acoustics.'

The loss of these two sentences detracted from the point John was making, which was that someone who was competent to design a building acoustically was apparently not competent to carry out tests to prove it. A grovelling apology has already been offered to the author, and is hereby made public. John, for his part, would like to apologise to some other members, the input from whom was editorially attached to his information about BB93. The whole was then released as purely his letter, which was not so. There are numerous concerned members with views on this subject and he doesn't want to take all the credit (or abuse).

Some responses to the important issues raised are published in this issue of Acoustics Bulletin.

Accreditation For Pre-completion Tests

May I make a few observations about John Houldsworth's letter in the last edition of Acoustics Bulletin, particularly with reference to testing under Building Bulletin 93 "Acoustics of Schools". I write as a member of the IoA, an examiner for the ANC scheme, and as one of the principal authors of BB93 although the following views are entirely my own.

I quite agree that it is inconsistent that under Building Regulations, anyone with a sound level meter may charge a fee for measuring sound insulation in schools, while to do so in dwellings the tester has first to demonstrate his competence. The DfES' advisers on acoustics considered this at the time of writing BB93, but this was before the ODPM had announced its requirements for accreditation. Clearly the DfES could not require accreditation which might differ from that required by the ODPM under the same part of Building Regulations. It is to be hoped that in a future revision the requirements for accreditation under parts E1 and E4 of the Regulations will be made more consistent.

The DfES' advisers also discussed at length the wording of the note in BB93 referring readers to the IoA for its acoustics consultants. I had suggested that both the IoA and the ANC should also be mentioned, as BB93 specifically recommends appointing an acoustics consultant, and the ANC is the only body in the UK that specifically represents acoustics consultants. I regret that this suggestion was not taken up, and at present there is no obvious way in which readers of BB93 will find out that the ANC exists, even if they go to the IoA website.

A common misconception (particularly in local authorities) is that membership of the ANC automatically qualifies a company to undertake pre-completion testing. This is not the case and there are stringent requirements for registration, checking and annual audits. Many applicants who have been measuring sound insulation for years are upset to find out that in fact their methods do not comply with those set out in Approved Document E or in some cases even with BSEN ISO 140, and it comes as a surprise to some that the proprietary software supplied with their sound level meters does not comply with either. This is an excellent illustration of two principles of any profession:

1. Experience is not necessarily the same as correctness; in an unregulated profession, some consultants have been getting things wrong for many years; and
2. Capability in one subject does not imply capability in another

subject. Of course the fact that a local authority has employed someone to measure environmental noise does not mean that person is competent to measure sound insulation.

It is natural that consultants outside the ANC should regard both the Association and the Registration Scheme with some suspicion or jealousy. ANC membership is, however, open to any acoustics consultants meeting certain standards of professionalism, competence and independence. The ANC exists to protect the interests of its members and their clients and to promote the reputation of the profession. It is wholly in keeping with those aims that the ANC should have spent a great deal of time and money to establish, and have the ODPM approve, an affordable alternative to the UKAS accreditation for PCTs. The ANC encourages applications for membership, and thereafter for registration, from suitably qualified consultancies. The number of successful recent applicants, ranging from sole traders to very large consultancies, illustrates the success of the scheme. Consultancies who do not wish to take this route still have the option of UKAS accreditation and several firms have done this successfully. Consultants opposed to any form of accreditation should take issue with the ODPM.

There can be no objection to organisations outside the ANC undertaking PCTs provided that they have UKAS accreditation or some other equivalent. What worries me, and should bother all professional acousticians, is that PCTs are still being carried out by people who, however experienced they may be, have never had to demonstrate that they are testing in accordance with the standards. As matters stand, anyone (MIOA or not) can call himself an acoustics consultant and charge for measuring sound insulation, with no need to show that they are doing so correctly and impartially. The resulting errors will inevitably lead to court cases which must damage the reputation of acoustics consultancy as a profession. The question that we and our clients should be asking, therefore, is why should professional and independent consultancies not seek registration or accreditation?

Adrian James

ADRIAN JAMES ACOUSTICS LTD.

Pre-completion Testing

I have been an active member of the Institute of Acoustics and the building acoustics group since 1985, founded my own independent consultancy in 1995 as a 'one-man-band' and became a member of the ANC in 2003. I am currently chairman of the committee which oversees the ANC Registration Scheme for pre-completion sound testing.

It was therefore with great interest and some disappointment that I read John Houldsworth's letter which was printed on Page 45 of the January/February edition of the Bulletin.

Mr Houldsworth implies, especially in his final and I believe deliberately provocative paragraph, that there is some sort of competition or conflict between IOA members and the ANC. This is absolutely not the case as all ANC member organisations employ at least one senior or principal consultant who is MIOA, following the ANC rules and byelaws which state that "50% or more of permanent consulting staff should have graduate or equivalent status and hold membership of a recognised learned society in acoustics". While this does not explicitly mention the IOA in the interests of inclusivity, in practice, it means that all ANC members DO have 50% of staff who are at least Corporate Member grade of the IOA. The two organisations are therefore entirely complementary.

So all that Mr Houldsworth says about the professional standing of IOA members, the benefits of IOA membership, including the CPD Scheme, is correct and is beyond question here. While my current status within the ANC might give a slightly biased perspective to some of the points I make in this letter, I must stress that I am also a loyal and active member of the Institute of Acoustics, as are all of my ANC member colleagues and friends.

Regarding pre-completion testing, however, Approved Document E (2003) is quite explicit and states that tests should only be carried out by **suitably qualified testers, who hold appropriate third party accreditation**. The ANC Registration Scheme was established in response to this by members of the ANC who were concerned at the cost and complexity of registration under UKAS, the only form of accreditation available at the time. The Scheme was successful in securing formal approval by ODPM early in 2004 and is referred to in the July 2004 amendment to the Approved Document, along with a reference to 'Robust Details' which offers builders an alternative to testing for newly-built dwellings.

Membership of the IOA, although very valuable and a pre-requisite to joining the ANC and its Registration Scheme, is insufficient in itself to demonstrate competence to carry out a specific test, such as that required under Approved Document E (2003).

To obtain registration under the ANC Scheme, the applicant must firstly be a member of the ANC. This is considered to be proof of competence and experience as an independent, practising consultant in acoustics with a suitable quality control system and adequate professional indemnity insurance. The applicant must then submit details of their test procedures, qualifications and experience of proposed testers, and instrumentation details including calibration certificates etc., to an examining body, in order to demonstrate that they are competent to carry out and report tests in accordance with ISO 140 Parts 4 and 7 and ADE 2003 (including arithmetic source averaging). The application process is rigorous and is subject to annual audit and 'witnessed testing', by an examiner, on a three yearly cycle. The application process, audits of members and administration of the

Registration Scheme is overseen by a committee within the ANC, which includes a representative from ODPM as an observer.

As a further quality check and as a pre-condition of the Registration Scheme, the results of each individual pre-completion test, even those which fail, are submitted to a third-party organization (CMMS), who re-check the calculation of the single number indices and issue a certificate for each test. This is presented with the test report as evidence to the builder and to the building control body that the tests have been carried out according to a scheme approved by ODPM.

A consequential, very useful, outcome of the ANC Registration Scheme is that CMMS maintain a database of all test results categorised by building type and construction type. The database is a unique record which currently holds data for over 25,000 tests and which is currently undergoing statistical analysis of fail rates etc. on behalf of ODPM. ANC members and eventually the building acoustics and the construction industry as a whole will benefit from the results of this analysis.

To turn to Mr Houldsworth's point about certain local authorities refusing to accept reports from non-accredited testers (UKAS and ANC), this is likely to be on the basis of what is considered to be 'best practice' even though it might not be mandatory. Whilst I can't speak for ODPM, the wording "should", in a Regulation, Code of Practice or Standard, usually means 'follow the guidance unless there is a very good reason not to do so' and gives the person following the guidance some legal protection in the event of a dispute.

This is not to say that a 'non-accredited' IOA member could not carry out tests perfectly adequately, but that the non-accredited tester is not subject to formal and regular 'third-party' review and inspection. He/she is also at some disadvantage being 'out-of-the-loop' in terms of member feedback, the benefit of shared experience, funded research and any guidance given by the registration/accreditation body in respect of improved test methods and improved reproducibility etc. The ANC Registration committee members (all volunteers) regularly receive queries and comments from members based upon their experiences on site and we try to give prompt replies, whether this is dealing with a bad debt, interpretation of a Standard, or a technical query concerning a particular instrument or its associated software.

My own experience, particularly as a 'one-man-band' is that membership of the ANC and the ANC Scheme has been extremely beneficial, not just in a commercial or technical way but also the feeling of belonging to a 'community' of professionals who share the same experiences and problems on a day to day basis. I wish I'd joined sooner! But this is by no means meant to devalue the similar benefits of being a member of the Institute of Acoustics, which is the measure of academic achievement and excellence within our profession, of which we are proud and without which the ANC could not exist.

I therefore urge Mr Houldsworth to consider membership of the Association and its Registration Scheme, as an alternative to UKAS or indeed non-accredited testing. I'm sure that any of the sixty or so ANC member organisations who are also Registration Scheme members, ranging from 'one-man-bands' to multi-national consultancies, would be able to confirm the positive aspects of the Scheme.

I have arranged for a membership pack and details of the ANC Scheme to be sent to Mr Houldsworth. For everyone else, the requirements for ANC membership and the Registration Scheme can be found on the ANC website on:

www.association-of-noise-consultants.co.uk/Pages/Introduction.htm

Iain Critchley MIOA
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PCB Piezotronics

Array microphones and filters

The Vibration Division of PCB Piezotronics Inc has announced important new additions to its growing line of acoustic measurement products.

The Model 379A01 array stand includes the grid and all necessary configuration hardware for proper mounting of a 16-microphone array with 8cm spacing. To optimise design flexibility, the 379A01 can be used in 1/16, 1/4, or 2/8 grid configurations; arrays are adjustable horizontally and vertically, rotated, or tilted forwards and backwards. A built-in inclinometer attached to the grid base enables the user to verify angles used for measurement, and ensures any subsequent measurement configurations can be replicated. Associated microphones, power supplies and cabling can be purchased separately or as a kit, to satisfy system requirements. The kit contains the microphones and sufficient 6m microphone cables for connection to an included patch panel and an accompanying 7.5m ribbon cable.

The Model 426B02, half-inch in-line A-weighting filter, which operates from ICP sensor power and is designed to work with prepolarised microphones, has also been introduced. The human ear naturally attenuates certain frequencies, and the manufacturer says that this filter is designed to simulate how a sound pressure level, at

different frequencies, would appear to a normal human ear. The weighting is, of course, commonly used in automotive, aerospace, and appliance testing applications among others. The goal might be safety, or to make the sound as pleasing to the ear as possible. The Model 426B02 can be attached directly to the BNC connector of a half-inch preamplifier, or between the preamplifier and a constant current supply (4 to 20 mA), via low cost coaxial cables.

PCB Piezotronics has also introduced the Model 377A20 prepolarised half-inch random incidence (diffuse field) microphone, which again operates from ICP sensor power. The distinguishing feature of this model is its extended frequency range to 6kHz (± 2 dB). It has a sensitivity of 50 mV/Pa and a wide dynamic range from 14.6dB(A) to 146dB(A). The microphone has a 150°C operating temperature range, with a temperature coefficient of -0.001dB/°C. This model is one of a full series of modern, prepolarised, condenser microphones and preamplifiers available from PCB. It is powered by a 2 to 20 mA signal conditioner and standard coaxial cables.

The ICP design allows for significant savings in power supply and cabling cost, greater ease of use, and operates from the same power required for ICP accelerometers. This provides the advantage of using microphones and accelerometers in the same test with the same signal conditioning equipment, minimising set-up time.

PCB offers a variety of acoustic measurement products, including prepolarised, traditional externally polarised, array, probe, low-profile

surface, and special purpose condenser microphones. Microphone products are complemented by an assortment of preamplifiers, signal conditioners, filters, handheld calibrators, and accessories.

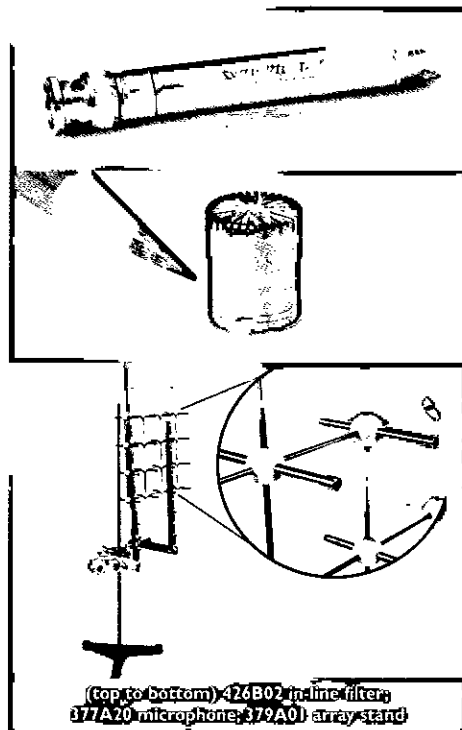
For additional information, contact the Vibration Division of PCB Piezotronics Inc on:

Tel: +1 716 684 0001

Email: vibration@pcb.com

Fax: +1 716 685 3886

Web site: www.pcb.com



Sound Reduction Systems Ltd.

Robust Detail acoustic socket and service boxes

Sound insulation expert Sound Reduction Systems Ltd has designed and developed a set of Robust Detail compliant socket and service boxes.

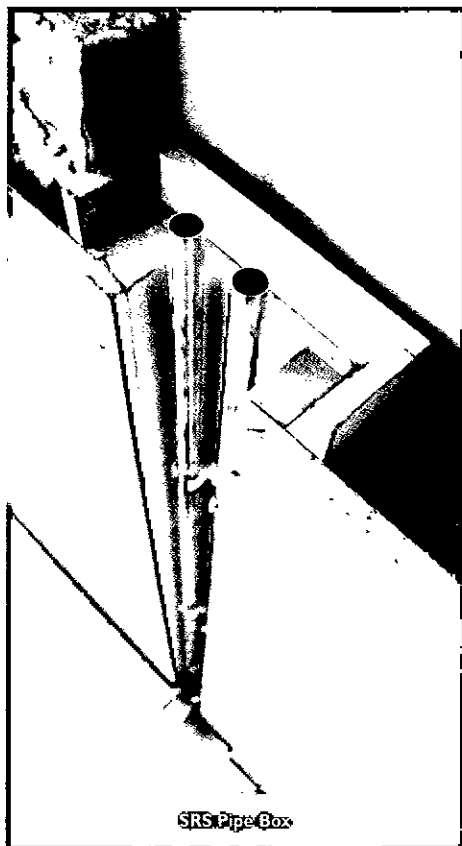
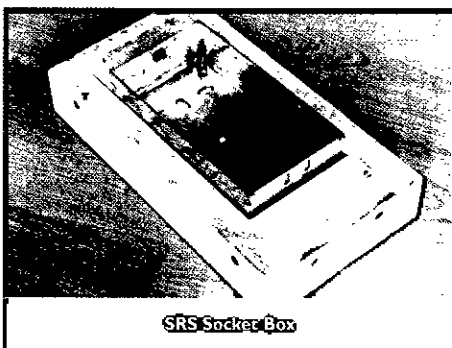
Fabricated from two layers of 10mm thick high density gypsum board, the sound insulating boxes are designed to ensure the acoustic integrity of any metal or timber framed separating walls that contain sockets or services.

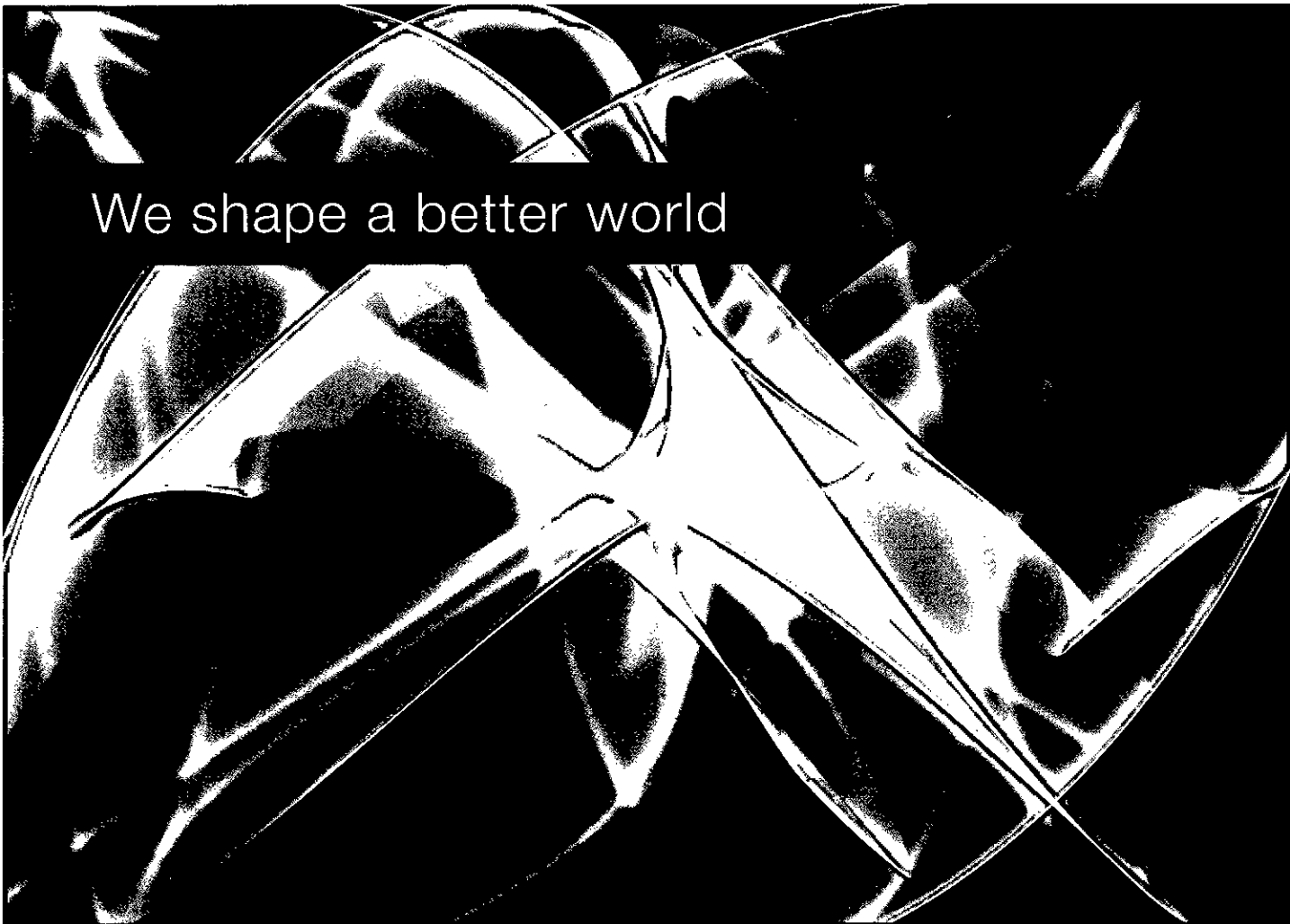
The boxes have been designed in line with Robust Detail guidance, and are suitable for use with E-WT-1, E-WT-2, E-WS-1 and E-WS-2. However, the boxes can also be used in standard applications where Robust Details are not required.

Technical Sales Manager Dr Roger Manifold said that the new acoustic socket and service boxes were an important addition to the company's existing acoustic portfolio, not only as a stand-alone product, but also as a complementary product for the high-performance acoustic building board, Maxiboard.

SRS socket and service boxes can be manufactured in standard and bespoke sizes. Simply installed by screw fixing the boxes into the partition cavity from the front, they offer a cost-effective treatment to areas of common acoustic weakness within walls.

For further information contact the SRS Technical Department on 01204 380074, or e-mail info@soundreduction.co.uk. Information can also be downloaded from the website www.soundreduction.co.uk





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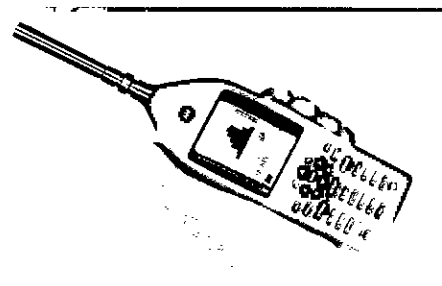
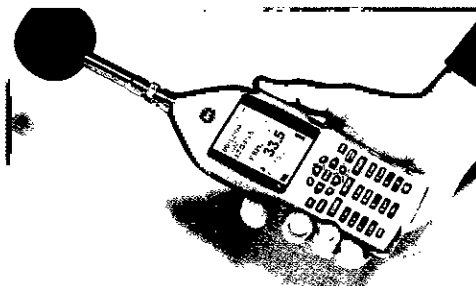
Sound level meters

Employers have a legal duty to protect the hearing of their employees. There may be a noise problem in a workplace if people have to shout or having difficulty being heard clearly by someone about 2 metres away. In addition to causing noise-induced hearing loss, noise can create stress and be a safety hazard at work, interfering with communication.

Previously accepted action levels by noise in the workplace have been reduced by the new EU Physical Agents (Noise) Directive 2003/10/EF. These noise exposure levels require employers to take certain steps to reduce the harmful effects of noise on hearing.

The first step is to carry out noise assessments on a regular basis. Norsonic AS is now releasing two new sound level meters which provides the ideal solution for this application.

The Nor131 (Class 1) and the Nor132 (Class 2) meters are designed for noise deafness risk assessments under the new EU Directive. They measure all the required functions, and present the results both during and after the



Nor131 & Nor132

measurement period. The $L_{Aeq,t}$ and L_{Cpeak} values are provided to allow the L_{EX} and peak action levels to be determined from quick and simple measurements at each workstation.

For a more detailed analysis, the instruments may be upgraded with optional whole-octave real-time frequency analysis. The resulting frequency spectrum is available at the same time as the initial measurement and gives the information necessary both to specify noise control measures and to prescribe personal hearing protection correctly.

In addition to the dedicated sound level meters, Norsonic is releasing a new dedicated software package. The Nor1025 NorProtector software calculates all the required results for the noise deafness risk assessments. With a quick 'drag and drop' operation all measurements from most Norsonic meters are imported, including the

new Nor131 and Nor132. The user only need to specify the duration of work at each position, and the values exceeding the action level turns out in colour. Individual data for each person may be entered.

The NorProtector software includes a database for selection of the most effective personal hearing protector related to the actual measured noise levels.

Contact: **Svein Arne Nordby**, Norsonic AS,
Email: sanordby@norsonic.com
or Campbell Associates Ltd,
Tel: 01371 871033, Fax: 01371 879106

Web site:

www.campbell-associates.co.uk

Campbell Associates is the exclusive distributor for Norsonic Instrumentation in the UK and Eire. The company offers sound and vibration instruments for sale and hire and run a traceable calibration laboratory.

Cypher Instruments

Impedance and frequency response analyser: 10Hz to 4MHz

Cypher Instruments has developed the C60, a low cost, portable scientific test and measurement device. This unit measures the amplitude, phase and impedance responses of electronic, electro-acoustic and other systems. The test results are displayed using a powerful graphing program.

The instrument investigates the opaque world of analogue networks. The unit operates in two test modes. It can measure the frequency response of a two-port system producing a gain/loss and phase graph. It can also measure the reactive response of a two terminal network producing an impedance/admittance and phase graph. Electronic, electrical, electro-acoustic and other networks can be tested with sine wave excitation and the results displayed on a PC. The C60 is USB powered: it needs no batteries or external power supplies, making it portable. It has a USB-B connector at the rear, an input and output BNC and a USB link activity led. All the functionality of the device is controlled by the PC.

The C60 can measure amplitude, impedance and phase responses from 10Hz to 4MHz. The frequency axis can be displayed logarithmically or linearly, with amplitude measured as gain or loss displayed in dB. Phase can be displayed

in ranges of 0 to 180° or $\pm 180^\circ$, and either impedance in ohms or admittance in siemens. Professional graphs can be produced with 10 plots per graph using a powerful interactive graphing program. Graphs can be saved as data files or jpg, bmp and meta files, with the capability of pasting plots from one graph to another.

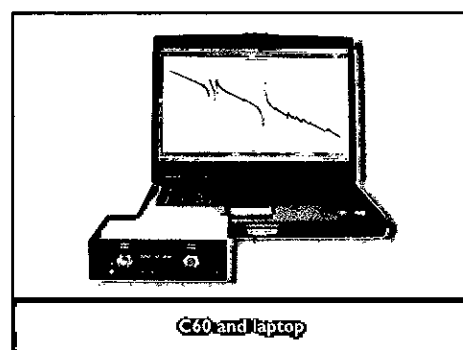
The easy-to-use PC interface provides reliable performance in a small, light weight, portable, USB powered device. This affordable solution can measure the frequency response (amplitude and phase) of electronic, electrical, electro-acoustic and other networks, make impedance measurements on two terminal networks (including phase), and will find applications in the design and production testing of electro acoustic transducers, biochemical impedance measurements, filter design and testing, and battery impedance testing.

Other capabilities include crosstalk and CMRR measurements, measurement of the characteristic impedance of cables, component evaluation, and estimation of system time delays and latency.

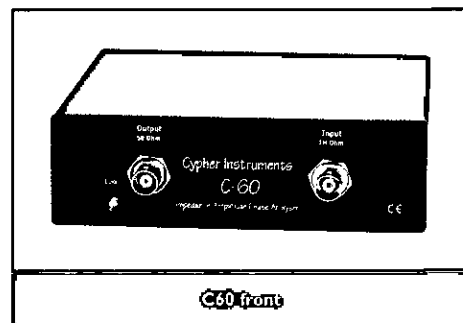
The unit is ideal for research, design, industry and educational establishments.

Cypher Instruments Ltd,
Phone and fax: +44 (0) 20 8392 9881

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C60 and laptop



C60 front

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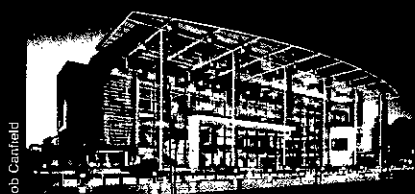
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Committee Meetings 2006

DAY	DATE	TIME	MEETING
Thursday	9 March	10.30	Engineering Division
Thursday	16 March	11.00	Medals & Awards
Thursday	16 March	1.30	Executive
Thursday	23 March	10.30	Diploma Examiners
Thursday	30 March	11.30	Council
Thursday	6 April	10.00	Meetings
Thursday	27 April	11.00	Research Co-ordination
Tuesday	9 May	10.30	CCWPNA Examiners
Tuesday	9 May	1.30	CCWPNA Committee
Thursday	11 May	10.30	Membership
Thursday	25 May	10.30	Publications
	TBA	TBA	Annual General Meeting**
Thursday	8 June	11.00	Executive
Tuesday	13 June	10.30	CMOHAV Examiners
Tuesday	13 June	1.30	CMOHAV Committee
Tuesday	20 June	10.30	CCENM Examiners
Tuesday	20 June	1.30	CCENM Committee
Thursday	22 June	11.30	Council
Thursday	29 June	10.30	Distance Learning Tutors WG
Thursday	29 June	1.30	Education
Thursday	6 July	10.30	Engineering Division
Tuesday	11 July	10.30	ASBA Examiners
Tuesday	11 July	1.30	ASBA Committee
Tuesday	8 August	10.30	Diploma Moderators Meeting
Thursday	7 September	10.30	Membership
Thursday	14 September	11.00	Medals & Awards
Thursday	14 September	1.30	Executive
Thursday	28 September	11.30	Council
Thursday	5 October	10.30	Diploma Tutors and Examiners
Thursday	5 October	1.30	Education
Thursday	12 October	10.30	Engineering Division
Thursday	19 October	10.30	Publications
Thursday	2 November	11.00	Research Co-ordination
Tuesday	7 November	10.30	CCENM Examiners
Tuesday	7 November	1.30	CCENM Committee
Thursday	9 November	10.30	Membership
Tuesday	14 November	10.30	ASBA Examiners
Tuesday	14 November	1.30	ASBA Committee
Thursday	16 November	10.00	Meetings
Thursday	23 November	11.00	Executive
Tuesday	5 December	10.30	CMOHAV Examiners
Tuesday	5 December	1.30	CMOHAV Committee
Thursday	7 December	11.30	Council
Tuesday	12 December	10.30	CCWPNA Examiners
Tuesday	12 December	1.30	CCWPNA Committee

** Subject to finalisation of dates and venue

Light refreshments will be served after or before all meetings. In order to facilitate the catering arrangements it would be appreciated if those members unable to attend meetings would send apologies at least 24 hours before the meeting.

Conferences & Meetings

Diary 2006

3-4 April 2006

Spring Conference: Futures in Acoustics

Today's Research - Tomorrow's Careers - Southampton

5-7 May 2006

The Sixth International Conference on

Auditorium Acoustics - Copenhagen, Denmark

17 May 2006

Measurement and Instrumentation Group

HARMful - judge for yourself! - London

11-12 September 2006

Underwater Acoustics Group

International Conference on Synthetic Aperture Sonar and Synthetic Aperture Radar - Lerici, Italy

10-12 April 2007

Underwater Acoustics Group

4th International Conference on Bioacoustics - Loughborough

Further details can be obtained from

Linda Canty at the Institute of Acoustics

Tel.: **01727 848195**

or on the IOA website: www.ioa.org.uk

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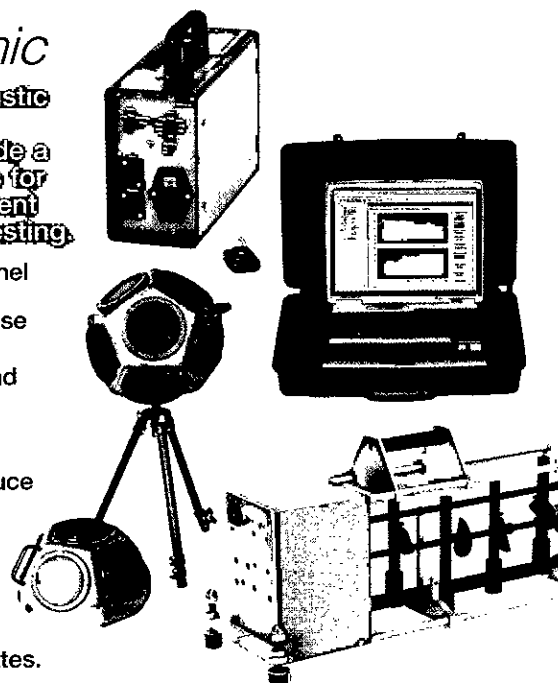
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Norsonic

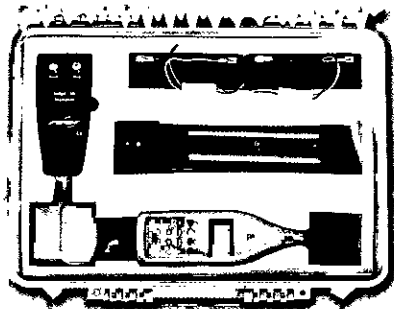
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- ◎ Drag and drop data to the NorBuild software to instantly produce test certificates.



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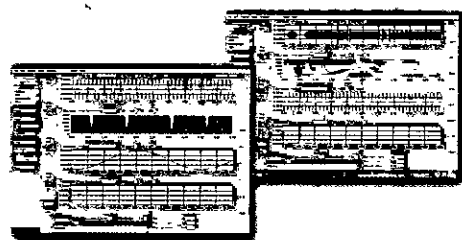
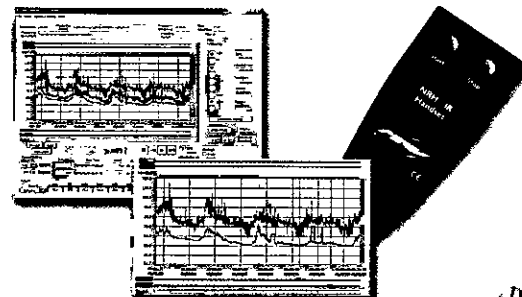
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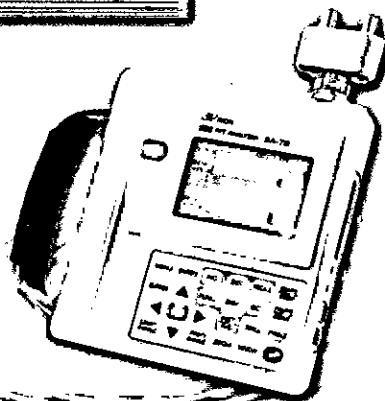
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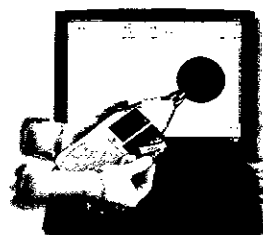


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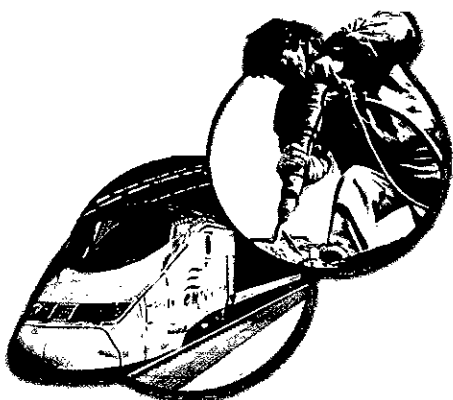
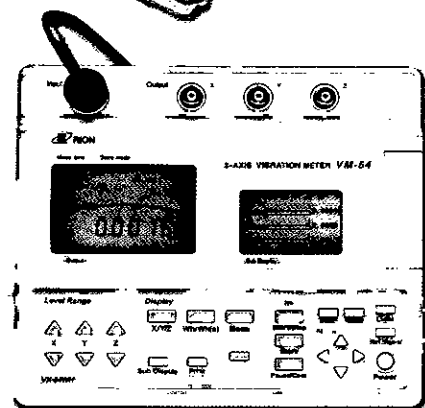
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