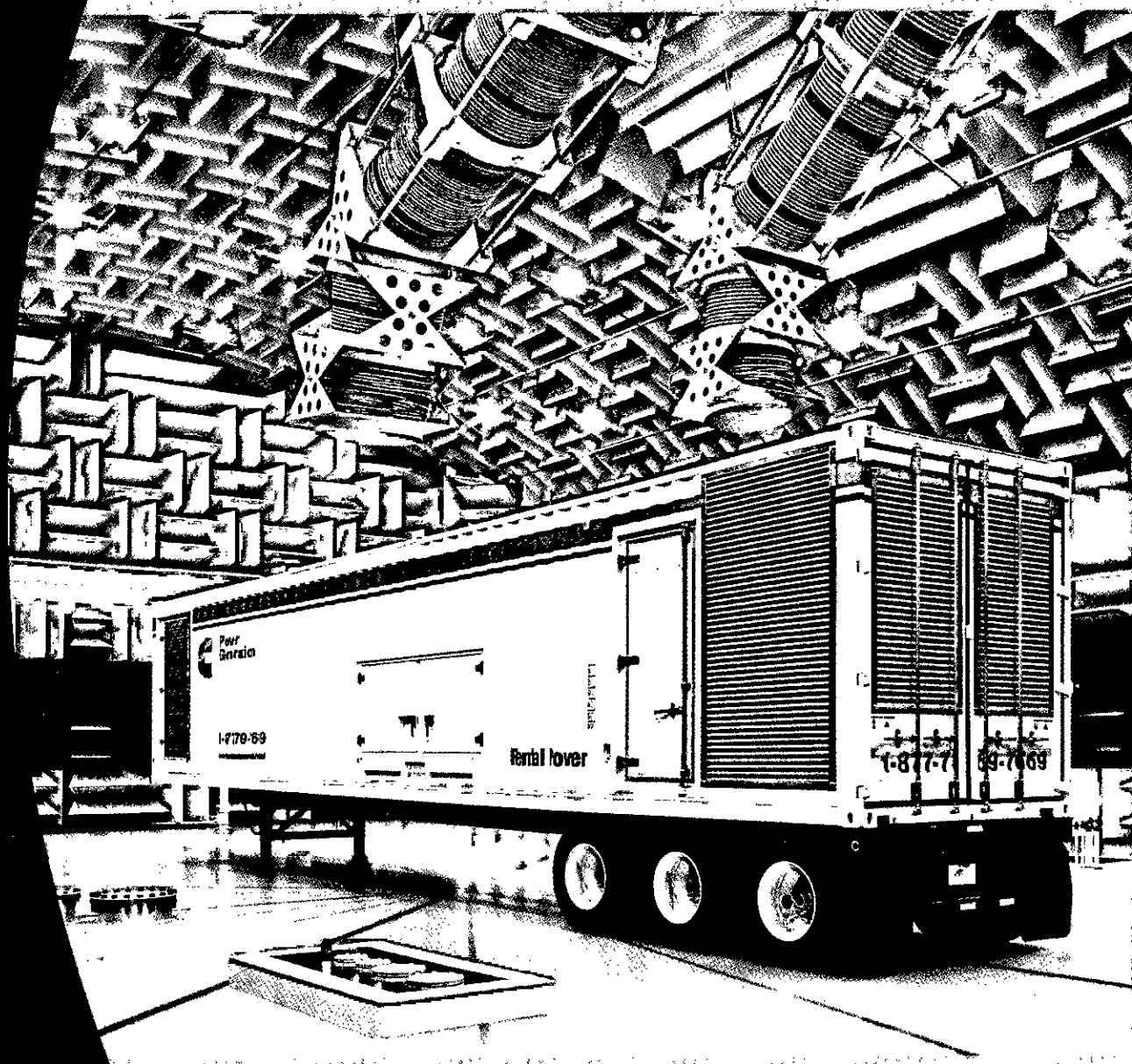
Vol 37 No 1 JANUARY/FEBRUARY 2012

ACOUSTICS BULLETIN



in this issue... IAC's giant US hemi-anechoic chamber is a world beater

plus... **Senior IOA figures scoop national noise awards**

Acoustic design of schools: a historical review

Environmental noise measurement: What you can get away with 90 per cent of the time!

Institute of Acoustics

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Contents

Front cover photograph: Front cover photograph: IAC turnkey hemi-anechoic chamber housing a 48ft diesel generator set which it has installed at Cummins Power Generation, a subsidiary of Cummins Inc., at its headquarters in Fridley, Minnesota, USA. The facility, which is the largest of its kind in the world, comprises a hemi-anechoic chamber, control room and preparation area. The chamber features a curved roof for an enhanced acoustic performance. See page 44 for full details.

The Institute of Acoustics is the UK's professional body for those working in acoustics, noise and vibration. It was formed in 1974 from the amalgamation of the Acoustics Group of the Institute of Physics and the British Acoustical Society.

Institute of **Acoustics**

The Institute of Acoustics is a nominated body of the Engineering Council, offering registration at Chartered and Incorporated Engineer levels.

The Institute has over 3000 members working in a diverse range of research, educational, governmental and industrial organisations. This multidisciplinary culture provides a productive environment for cross-fertilisation of ideas and initiatives. The range of interests of members within the world of acoustics is equally wide, embracing such aspects as aerodynamics, architectural acoustics, building acoustics, electroacoustics, engineering dynamics, noise and vibration, hearing, speech, physical acoustics, underwater acoustics, together with a variety of environmental aspects. The Institute is a Registered Charity no. 267026.

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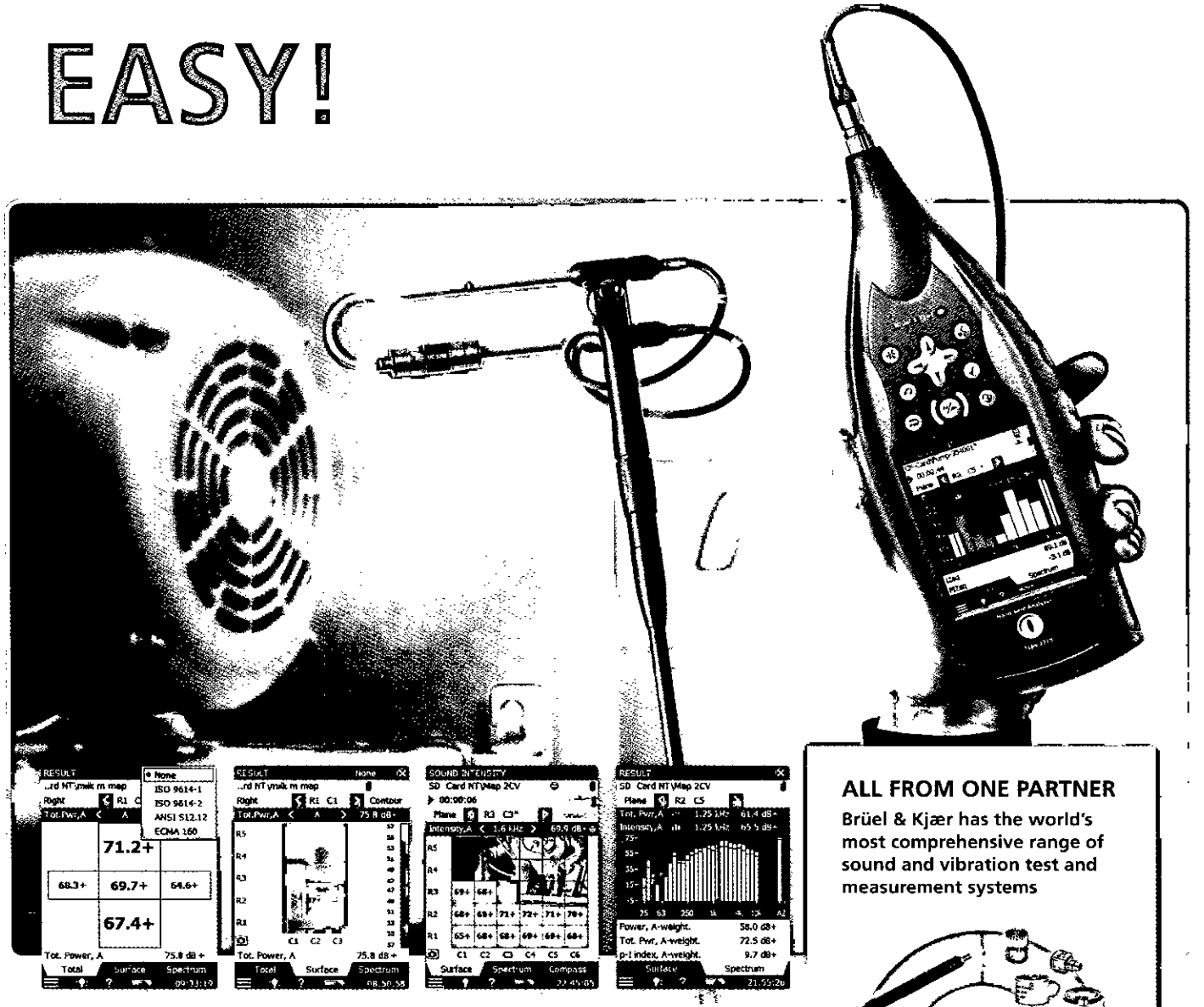

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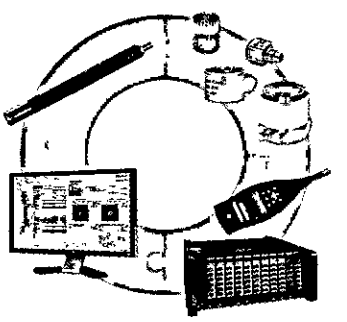

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Dear Members

Reproduced Sound had a wonderful mixture of talks and demos. Bob Walker received the Peter Barnett Memorial Award. I greatly enjoyed Bob's lecture, especially an old photograph of a waterfall plot made from Lego. It was an enterprising way of representing the acoustic data in the days before powerful computers, exploiting BBC Management's collection of iconic plastic bricks.

While conferences such as Reproduced Sound continue to be well received by delegates, the budgeting of all IOA events is going to come under increasingly close scrutiny because too many are making losses. Technical committees, the Meetings Committee and office staff are going to have to collaborate more closely. The Institute will probably have to use cheaper venues and maybe even shorten some conferences to reduce expenditure as venue costs escalate.

Bob Walker's Lego photo reminded me of the swanky new home for the BBC in MediaCityUK, Salford Quays. Not the buildings, which were awarded the Carbuncle Cup by Building Design magazine, but the inside of the offices with their weird shaped seating, bean bags and walls you can scribble ideas on. The fit-out appears inspired by Google's headquarters with its air hockey and pool tables.

I was at MediaCityUK as a guest on BBC Radio 4's Infinite Monkey Cage, with the recording taking place in the new BBC Philharmonic Studio. Luckily, the last Bulletin had an article about the acoustic design of the space written by Mark Howarth of Sandy Brown Associates, which made answering questions about the design of the hall much easier. Another guest was comedian Tom Wrigglesworth, who studied acoustics at Salford. When asked to comment on this he stated that "acoustics ... well basically it's a lot of hard maths".

For the last few weeks, MediaCityUK has been home to Aeolus, a wind driven sculpture. It creates a strange ghostly sound reminiscent of alien sounds from old sci-fi movies. Sadly, as I type this letter, occasionally staring out of the window of the University's building for inspiration, I can see the steel 'hedgehog' slowly being disassembled and removed. The sculpture's acoustic design was supported by acousticians at Southampton and Salford Universities. It was impressive when it worked, but it didn't like the rain as water stopped the wires vibrating and singing - a bit of a drawback for a sculpture in Manchester!

I've had many conversations over the years with Bob Walker about the reduction in acoustic research carried out by the BBC. But things now seem to be improving. BBC R&D has now formed an Audio Research Partnership working with Salford University for acoustics research and Surrey University for audio-visual research. They will also be working closely with Southampton, Queen Mary, University of London, and York.

One thing the Audio Research Partnership will tap into is the exciting audio times we work in. Barely a week passes by without a new technology being launched. Currently, it is Siri, the voice command system on the iPhone 4S, which is gaining lots of news coverage. People have been having fun asking it ambiguous questions, "Do you like acoustics?" brought up the answer "I'd rather not say, Trevor". Actually, the voice recognition and interpretation is very impressive, ask "what is a decibel" and it displays the correct dictionary definition.

I contemplated asking Siri to suggest a name for the next President-Elect, but then thought better of that idea. A more conventional and sensible route through Council has resulted in the nomination of William Egan, Brüel & Kjær's Northern Europe Managing Director, an excellent choice.

Trevor Cox

PRESIDENT

The 10th Congress on Noise as a Public Health Problem

ICBEN comes to London for the first time Report by Bridget Shield

The 10th Congress on Noise as a Public Health Problem was held at Imperial College London from 24th to 28th July 2011. The congress was organised by the IOA on behalf of the International Commission on the Biological Effects of Noise (ICBEN), and was the first ICBEN conference in its 45 year history to be held in the UK. The purpose of ICBEN congresses, which are now held every three years (rather than every five years as previously) is to present and review current and recent research in a number of areas related to the effects of noise, with the aim of influencing national and international noise policy.

The congress was a very great success and thoroughly enjoyed by the 250 delegates who travelled from many parts of the world to be there. All continents were represented with delegates from Europe, the Middle and Far East, Australia, Africa and the Americas. The standard of technical papers, both oral and poster, was as usual very high and delegates enjoyed the conference venue and the conference dinner which was held in the nearby Science Museum. The success of the congress was aided by the weather; a hot, sunny week meant that during coffee and lunch breaks delegates were able to enjoy sitting outside in the sun while relaxing and networking with colleagues.

With nearly 200 papers, it is not possible to give a detailed description of the technical content of the congress. The following is a brief overview of the topics that were covered in the individual team sessions. In due course the proceedings will be available on the main ICBEN website (www.icben.org). The sessions for which the highest numbers of papers were submitted were noise induced hearing loss (Team 1) and community response to noise (Team 6) – an indication of the continuing widespread interest in these areas throughout the world.

Team 1: noise induced hearing loss

This session, the largest of the individual team sessions, reported research from many countries into various aspects of hearing loss. Many papers examined the prevalence and causes of NIHL, including risk of hearing loss caused by vuvuzelas, starting pistols, and MRI scanning. Another source of NIHL that was the subject of a large number of papers was music, with many authors presenting research into risks from both classical and popular music to the hearing of performers and listeners. Of great interest were papers from the USA and Poland reporting studies which have identified factors that increase susceptibility to NIHL; these include certain genetic factors and diet, particularly low protein diets, opening up the possibility of using dietary supplements or drugs to prevent or reduce the likelihood of NIHL.

Team 2: noise and communication

Papers in this session covered a range of topics related to communication needs at work, in school and in open plan offices. The conflict between the need for hearing protection and communication was discussed, together with an update on fitness standards for hearing-critical jobs. Other papers discussed barriers to hearing among schoolchildren, ageing adults and people with hearing loss. The design of warning signals was also the subject of several papers.

Team 3: non-auditory effects of noise

A review of the large body of research into the relationship between noise and cardio-vascular disease was presented, together with a review of studies which have aimed to identify those groups who are particularly vulnerable to effects of noise on health, such as children, older adults and pregnant women. Results from several of these studies were presented with links between health and specific noise sources including aircraft, rail, road traffic and workplace noise being examined, plus the effects of urban noise and the need for quiet areas. Several authors aimed to identify personal, demographic, psychological and physiological factors which affect the response to noise. Dose response relationships between noise and hypertension, the risk of stroke and coronary heart disease were also presented.

Team 4: effects of noise on performance and behaviour

The major focus in this team's sessions was the effects of noise on the cognitive performance of children and adults; other areas affected by noise that were discussed included attention, memory and language. The effects of noise exposure at school and in the workplace (offices and hospitals) were discussed, together with the mechanisms underlying these effects. In addition to objective measures of performance several papers also considered subjective assessment of noise and its consequences.

Team 5: effects of noise on sleep

There have been many field studies in the past three years, particularly into the effects of transportation noise on sleep. Papers were presented covering the effects of noise from various sources including wind turbines. A study of sleep disturbance in Switzerland found that a major cause of awakening is the ringing of church bells. Surprisingly, a laboratory study in Germany found that nocturnal freight trains caused more awakenings than aircraft noise. Other papers investigated individual, demographic and situational factors which are related to susceptibility to sleep disturbance by noise.

Team 6: community response to noise

The large number of papers presented by this team show that the topic is still a major area of research throughout the world, with many research teams attempting to establish more reliable and more complex dose response relationships. Many papers investigated the response to noise from a wide variety of sources; as well as studies of transportation noise, other types of noise included noise from construction, gas turbines, military shooting, blast noise and noise in nursery schools. The effects of low frequency noise and vibration were also considered. A review of effects of changes in noise level was presented. Different ways of considering and modeling community response were discussed, for example the use of biological models and the application of soundscape research in examining the impact of noise. The need for further research in these areas, and in studying effects of combined noise sources was emphasised.

Team 7: noise and animals

There were only three papers, all from the UK, submitted to this team. However, it was decided that this topic will continue to be represented by an ICBEN team in the hope that more papers will be presented at the 2014 congress. The papers presented concerned the impact of wind turbine noise on bats, the assessment of noise impact on marine mammals, and the importance of considering very high frequency (up to 150 kHz or above) noise when assessing the impact on animals.

Team 8: interactions with other agents and contextual factors

Many papers in this team's sessions complemented those in other sessions. Among the topics discussed were perceptions/ annoyance/quality of life effects due to noise in urban areas, public spaces and hospitals. Annoyance due to road traffic and aircraft noise was also discussed. Soundscape research again featured strongly with the importance of interdisciplinary research being emphasized. Further to research

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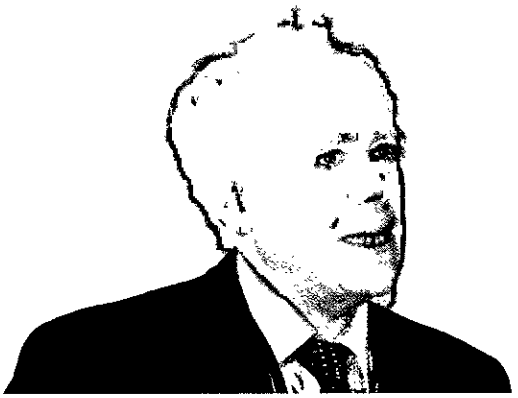
Stephen Stansfeld, ICBEN chairman

Networking - a good opportunity to talk



Daniel Instone, Defra

Adrian Davis, Royal Free Hospital and ICBEN UK committee member

Exhibition

Charlotte Clark, Queen Mary University of London and ICBEN UK committee member

Exhibition

Ken Hume, Manchester Metropolitan University and ICBEN UK committee member

ICBEN comes to London for the first time - *continued from page 6*

presented by Team 1, two papers dealt with the influence of ototoxic chemicals in the work place, including farms, on hearing impairment.

Team 9: policy and economics

This is an important team which evaluates the influence of research on noise policy. The plenary session was dedicated to Michiko So Finegold who very sadly died suddenly in the summer of 2011. Michiko was a long time ICBEN supporter who participated in many conferences. We were very grateful to her husband Larry for not only coming to London but also for his sterling work in putting together a large and successful session for Team 9. An overview of international policy developments found that there has been a large amount of work in the past three years with new or draft policies in many countries. Papers discussed current and emerging policy in Europe (UK, Germany, Ireland, Sweden, Latvia), South America (Brazil), Asia (Japan, Taiwan), USA and Australia. An update was given on the work of the international consortium on noise issues in developing and emerging countries. A notable focus of much of the research presented was current work in evaluating the health and economic costs of environmental noise including mitigation of aircraft noise, access to quiet areas, and noise from industrial activity.

The success of the congress was due to the hard work of many people, not least the international team chairs who arranged such interesting and well attended technical sessions on a wide range of topics. ICBEN is grateful to the IOA office for organising the congress, and in particular to Linda Canty, for her usual hard work and efficiency in ensuring the smooth running of all aspects of the conference. We would also like to thank Trevor Cox (IOA President) for his entertaining talk after the very enjoyable conference dinner at the Science Museum. I would also like to thank the ICBEN secretary Mathias Basner for his assistance in compiling this report.

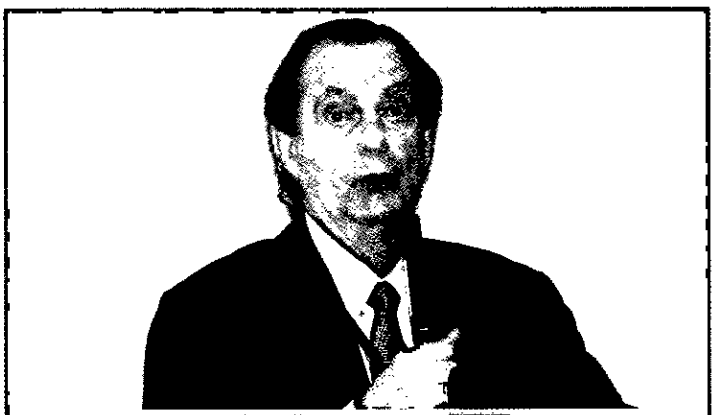
Jerry Tobias (left), one of the founders of ICBEN series of conferences, chats with IOA President Trevor Cox

Stephen Stansfeld, ICBEN chairman

Bridget Shield, chairman of ICBEN UK committee and speaker

Trevor Cox, IOA President

Pre-dinner drinks at the Science Museum



Larry Finegold, speaker, longer-term ICBEN supporter and a sponsor of ICBEN 2011

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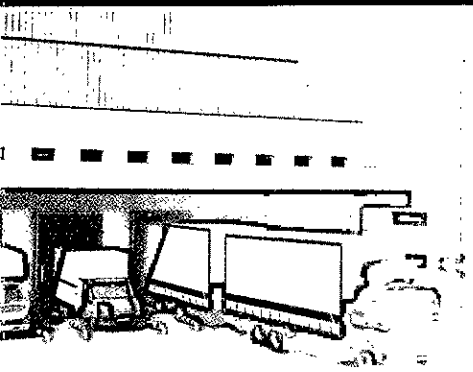

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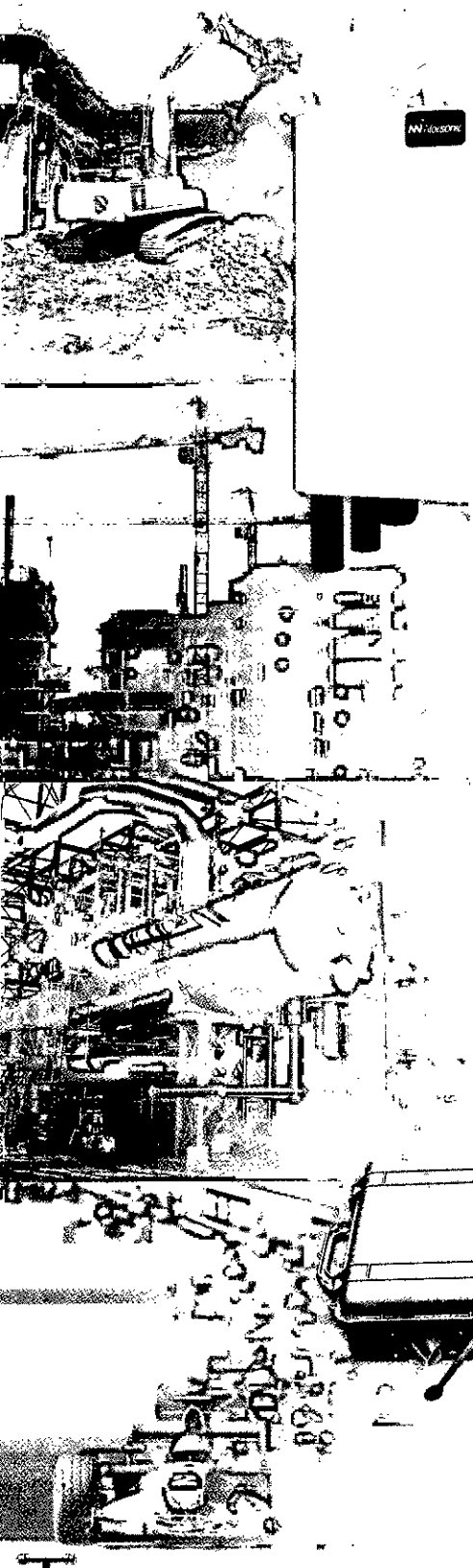

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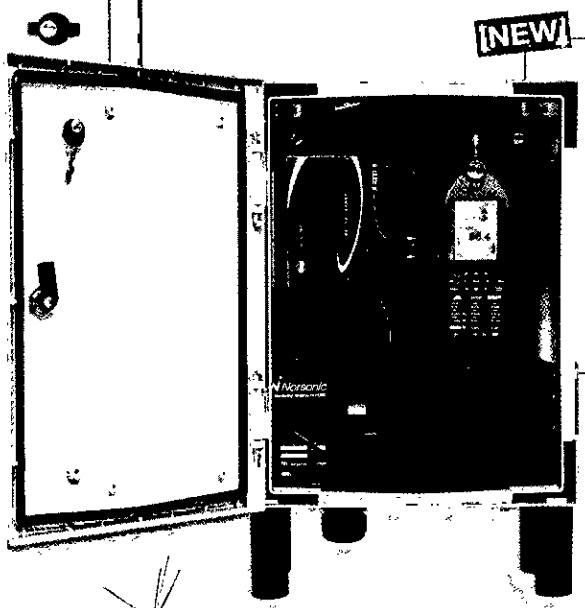

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Ambient noise in north European waters

Conference report by: Michael Ainslie, Peter Dobbins, Dick Hazelwood, Victor Humphrey, Paul Lepper, Stephen Robinson and Roland Rogers

An international conference titled Ambient noise in north European waters: monitoring, impact and management was organised in October by the Institute of Acoustics and the Marine Science Coordination Committee (Underwater Sound Forum). The conference, held at the National Oceanography Centre (NOC), University of Southampton, was attended by 83 delegates from 11 countries, with five invited keynote speakers and a programme of 35 papers. It addressed the topical issue of underwater noise. Ambient (background) noise levels in the sea are increasingly influenced by man-made activities, which have the potential to change the soundscape of European waters. Underwater noise has been classified by the EC as a pollutant in connection with the assessment of Good Environmental Status (GES) under the Marine Strategy Framework Directive (MSFD). This has led to increased activity in this field within Europe, where noise monitoring is becoming a topic of increasing importance.

After opening remarks by the co-chairs (Stephen Robinson and Roland Rogers), the conference started with a session on policy, regulation, strategy, and drivers, chaired by Roland Rogers of NOC. The first paper was a keynote lecture on challenges in implementing the MSFD for managing underwater noise in European waters by Mark Tasker of JNCC. Mark described the way forward to implement the MSFD indicators which relate to two types of underwater sound: (i) high amplitude (loud), low and mid frequency impulsive sounds, and (ii) ambient sound within frequency bands dominated by shipping. As co-chair of the EU Technical Sub-Group on underwater noise, Mark was ideally placed to give a comprehensive overview of the topic. This was followed by Jens-Georg Fischer (BSH, Germany) who spoke about acoustic monitoring in North and Baltic Seas within the German Marine Environmental Network. Frank Thomsen (DHI) then described a strategy for monitoring ambient noise for the MSFD, with particular focus on low frequency continuous noise associated with shipping. A second keynote lecture in the session was then given by Ian Boyd (Scottish Oceans Institute, University of St Andrews) on the International Quiet Ocean Experiment. The objective of this is to coordinate the international research community to both quantify the ocean soundscape and examine the functional relationship between sound and the viability of key marine organisms. The results from an Open Science Meeting in Paris during September were presented, where a plan was developed to synthesise community-based views about how this experiment should be constructed.

A session followed on methodologies for noise monitoring chaired by Victor Humphrey of ISVR. The first paper was by Roberto Racca (JASCO) on modelling and monitoring techniques in ambient noise management where he covered a range of techniques he has applied to address the difficulties that are commonly encountered. Andrea Luebben (DEWI GmbH) then gave a comprehensive overview of sub-sea noise monitoring in the German North Sea. This was followed by an entertaining presentation from Jonathan Carter (Atlas Elektronik) on how naval sensors may be used to make measurements of underwater ambient noise, and a paper by Peter Dobbins (Ultra Electronics) on the possibilities provided for ambient noise monitoring using sonobuoys which may be suitably adapted for the purpose. The final presentation of the day before the evening reception at NOC was by Kate Liddell (UKHO) reporting the results of an analysis of existing historical data from MOD sonobuoy deployments for use in ambient noise studies.

The second day began with a keynote lecture by Michel André (Technical University of Catalonia) on sea observatories for global monitoring of ocean noise. Michel gave an impressive demonstration of the LIDO (Listen to the Deep-Ocean Environment) system of linked ocean observatories which provide real-time data on underwater noise at locations around the globe. Following on from this, Nathan Merchant (Bath University) presented data on ambient noise in the western English Channel and its correlation to tidal cycles and shipping patterns, after which Peter Sigray (Swedish Defence Research Agency) presented a paper describing data for different noise sources such including an offshore wind farm and shipping in the vicinity of Öresund sound.

A session followed on technology for noise measurement, chaired by Dick Hazelwood (R&V Hazelwood). This set of papers provided a diverse selection of interesting topics, including several on transducer systems. Paul Lepper (Loughborough University) set the scene with the requirements for such systems, and Mark Wood (Instrument Concepts) described some recent developments in ultra-low frequency hydrophones to address some of these requirements. Paul Yeatman (GeoSpectrum Technologies) gave details on methods of measurement of particle velocity, devices which are scheduled to be used by Eugene McKeown (Biospheric Engineering) in his nose monitoring work in Galway Bay. Alessandra Tesei (AGUAtech) kept us up to date with developments in Italy on high performance hydrophones for noise monitoring, whilst Thomas Folegot (Quiet-Oceans) gave us an account of his work on an operational anthropogenic ocean noise prediction system, which has been validated against measurements made with a hydrophone close to busy shipping lanes.

The following session was on noise characterisation, chaired by Peter Dobbins. The first paper was a keynote lecture by Michael Ainslie

continued on page 12

Stephen Robinson, co-chairman

Mark Tasker of JNCC

Ambient noise in north European waters - *continued from page 10*

(TNO) on the influence of changing sea conditions on shipping noise. Michael covered a broad range of topics including the effect of the presence of fish on shipping noise measured close to a major shipping lane near to the Port of Rotterdam, and potential causes of long term increases in ambient noise, including long term trends in the number and size of shipping vessels and increased ocean transparency due to climate change. This was followed by a typically entertaining presentation by Paul White (ISVR) on measuring the underwater noise signatures from cruise ships. Gary Hayman (NPL) then followed this with a paper on noise measurements on UK dredgers and the potential contribution to overall anthropogenic noise from this source. Dick Hazelwood then presented a thought-provoking paper on the comparison of air and water acoustic data, with options for novel ways of modelling of ship noise. Finally in this session, Paul Lepper gave his second paper in the conference, this time on determination of the long term contributions to ambient noise levels from construction of a typical offshore wind farm development.

The first session on the third day was on analysis of noise data, chaired by Michael Ainslie. Mark Prior (CTBTO) kicked off the morning after a successful conference dinner on-board the Princess Caroline. In his keynote lecture, Mark described the International Monitoring System (IMS) of the Comprehensive Test Ban Treaty Organization. The IMS includes a network of deep water hydrophones with a passband from 1 Hz to 100 Hz and sample frequency 250 Hz, the purpose of which is to monitor underwater sound for evidence of nuclear explosions. Acoustic data are recorded continuously by the network and are therefore suitable for long term noise monitoring. Mark showed a number of examples of scientific use of the data, including detections of icebergs and migrating whales.

Two talks followed examining possible correlations between ambient noise and effects on marine mammals. The first was by Jakob Tougaard of Aarhus University, who described measurements of shipping noise from ferries and other ships in Danish waters, and correlations with abundance of the harbour porpoise. He made a case for a high frequency noise indicator for shallow water to supplement the existing low frequency indicators at 63 Hz and 125 Hz. Jakob's talk was followed by Daniel Toogood (NOC) who described trends in UK cetacean strandings and the results of his research investigating a possible link between these and ambient noise. Max Schuster (DW-ShipConsult) completed the first morning session by describing a collaborative project involving several German institutions. The objectives of the project are to monitor seasonal trends in ambient noise, and to investigate the physiological effects of high levels of sound on selected animals, such as harbour porpoise, grey seal and fish.

The session on analysis of noise data was continued in the final session of the conference chaired by Paul Lepper. The first paper was presented by Ben Wilson from the Scottish Association of Marine Science (SAMS) and co-authors from SAMS and EMEC the European Marine Energy Centre. Bens talk discussed problems and solutions to the measurement of sound fields in high tidal flow areas. This paper was followed by a presentation by Caroline Carter also from SAMS co-authored with Ben showing ambient noise mapping data from a potential tidal energy site in the Sound of Islay using drifting recorders. Ed Harland (Chickerell Bioacoustics) then gave a presentation on diurnal, lunar and annual cycles in ambient noise levels at two UK coastal sites. The final talk of the conference was then given by Nathan Merchant (Bath University) who was gallantly standing in for a number of absent authors from University of Gdansk, Scripps Institution Oceanography, the Maritime Institute in Gdansk and the University of Bath on the topic of underwater ambient noise of glaciers in Svalbard and how this may be used as indicators of dynamic processes in the Artic.

The conference was characterised by a great deal of interaction, numerous questions following each presentation. Following the last session a brief open forum for future questions and research topics was held then the conference was then closed by conference chair Stephen Robinson (NPL).

Ian Boyd of Scottish Oceans Institute, University of St Andrews

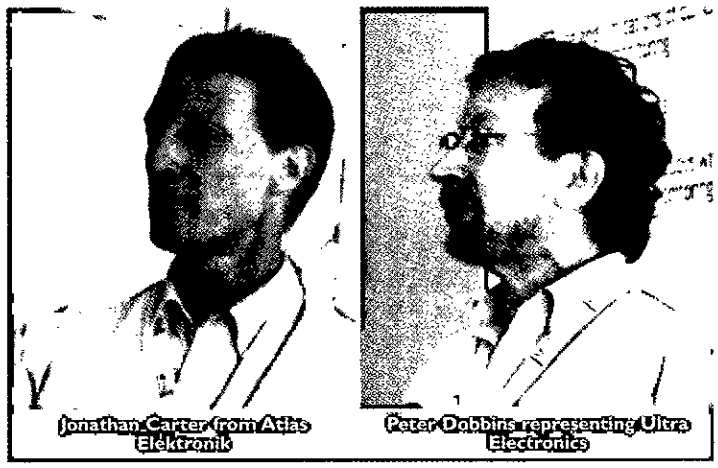
Michel André of Technical University of Catalonia

Roland Rogers of NOC

Roberto Racca of JASCO

Michael Ainslie of TNO

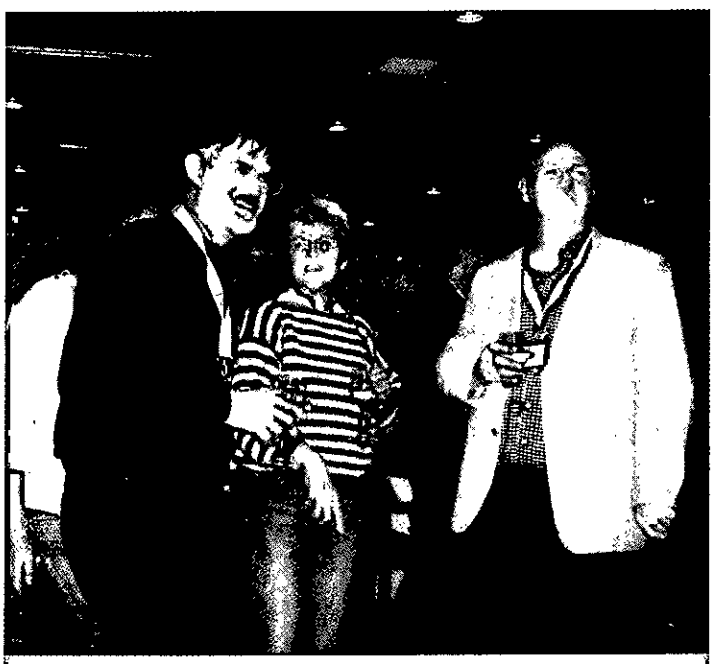
Stephen Robinson from NPL opens the conference



Jonathan Carter from Atlas Elektronik

Peter Dobbins representing Ultra Electronics

Delegates enjoy a lively presentation



Evening reception on board Princess Caroline

Paul Lepper of Loughborough University

Ed Harland of Chickerell Bioacoustics

The Institute of Acoustics Diploma results 2011

Professor Keith Attenborough, IOA Education Manager

In 2010/2011 the IOA Diploma in Acoustics and Noise Control was presented at five centres based in Higher Education Institutions (Derby University, Leeds Metropolitan University, NESCOT, University of Salford and the University of the West of England), and a further five centres (St. Albans, UWE Bristol, Napier Edinburgh, Cornwall and Ulster) hosted the tutored distance learning version. Sadly Colchester Institute did not offer the Diploma in 2010/11 and has decided not to offer the Diploma in future. The 2010/11 Diploma presentation was the third year of the "revised" Diploma. One of the additional thresholds introduced as part of the Diploma revisions in 2008 was the requirement to gain at least 50% in a short answer questions section (*section 'A'*) of the General Principles of Acoustics Module. This was to ensure that candidates have studied a wider range of the syllabus than required to pass the "long answer" questions (in *section 'B'*) and to test their ability to carry out basic calculations and their understanding of commonly used acoustical definitions. In the two previous examinations under the revised Diploma structure, this additional threshold increased the number of fails on the GPA Module significantly. However, in 2011, only one of 19 GPA candidates who failed the written examination did so for this reason. Those that passed gained good marks on the short answer questions involving the addition and subtraction of sound levels. Nevertheless 'Section A' questions about FFT and mechanical resonance caused widespread difficulty. Long answer questions about barriers and sound transmission were popular and answered well. The long answer question on vibration, although unpopular, was answered well by those who attempted it.

This year at the suggestion of the new chief examiner (Stuart Dyne) a criterion based on the mean marks and their standard deviation was introduced to decide whether or not to moderate marks for the specialist modules. As in previous 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. To obtain a Merit grade on the specialist modules, candidates were required to have conflated mark and written examination marks of at least 70%. No merit was awarded if it depended on a deferred score.

The number of Merits on the Noise and Vibration Control Engineering Module in 2011 was the highest ever at nearly 39%. The 2011 mean mark on the Regulation and Assessment of Noise (RAN) examination was the lowest since the Diploma restructuring. Nevertheless the number of Merits for the RAN Module in 2011 (about 12%) is similar to last year since there was an improved mean coursework mark. The Laboratory Module continues to have a high percentage of Merits (nearly 40% in 2011).

The numbers of candidates who gained Merits (M), Passes (P) or Fails (F) in each Module are shown for each Centre in the Table of Results. The "Fails" include those who were absent from the written examinations. The results of 12 appeals (only two of which were successful) are included also. There were 109 candidates entered for the General Principles of Acoustics (GPA) written paper in 2011. The numbers of candidates in previous years were 134 in 2010, 144 in 2009, 178 in 2008, 167 in 2007, 216 in 2006, 135 in 2005, 140 in 2004, 121 in 2003, 154 in 2002, 129 in 2001 and 150 in 2000. There were 41 candidates for Regulation and Assessment of Noise (RAN), 61 for Noise and Vibration Control Engineering (NVCE), 61 for Building Acoustics (BA) and 69 for Environmental Noise Measurement, Prediction and Control (EN). Of the 37 candidates who failed the project, 34 did not submit and will have to repeat the project module next year.

Centre/Grade	GPA	PROJ	LAB	BA	NVCE	RAN	EN
Distance Learning (Bristol)							
Merit	1	0	1	1	1	1	0
Pass	3	1	1	0	0	0	1
Fail	0	2	0	0	0	0	0
Distance Learning (Cornwall)							
Merit	0	0	0	0	0	0	0
Pass	0	0	1	0	0	0	0
Fail	1	1	0	1	0	0	1
Distance Learning (Edinburgh)							
Merit	2	2	1	1	1	0	3
Pass	7	5	6	1	2	2	3
Fail	1	2	0	0	0	1	1
Distance Learning (St Albans)							
Merit	8	2	2	3	3	0	0
Pass	3	8	10	9	5	2	3
Fail	4	9	2	0	3	2	4
Distance Learning (Ulster)							
Merit	4	2	5	3	3	0	2
Pass	5	6	4	4	1	4	3
Fail	2	3	1	0	0	0	1
Leeds Metropolitan University							
Merit	6	5	7	3	3	0	3
Pass	7	8	3	4	3	0	4
Fail	2	3	1	0	2	2	1
NESCOT							
Merit	8	4	8	5	5	0	3
Pass	4	4	2	1	2	3	3
Fail	4	8	3	1	5	2	2
University of Salford							
Merit	3	4	5	4	6	0	0
Pass	8	6	6	6	5	0	0
Fail	1	3	0	3	1	0	0
University of Derby							
Merit	4	5	11	2	2	1	7
Pass	13	15	8	5	3	6	8
Fail	3	3	0	2	4	2	1
University of the West of England							
Merit	0	3	0	1	1	3	6
Pass	4	7	0	2	1	8	7
Fail	1	3	0	0	0	2	2
TOTAL							
Merit	36	27	40	23	25	5	24
Pass	55	60	41	32	22	25	32
Fail	19	37	7	7	15	11	13

Table 0

IOA Diploma Results Chart for 2011

The prize for best overall Diploma performance (based on the total marks awarded for five merits including project) is to be awarded to Luke Rendell (NESCOT). Special commendation letters for also achieving five Merits (including Project) have been sent to Esam Abu-Khiran and Mark Boyle (DL Ulster), Louise Morris and Anne Unwin (NESCOT), Benjamin Mosley, Thomas Sidebottom and Aidan Smith (Leeds) and Robert Lafrati (Salford). Esam Abu-Khiran was the best performing student in Ireland. Nine of the 27 projects awarded merits are being considered for the ANC best project award

Last but not least I would like to express thanks to all tutors and examiners and to Hansa Parmar in the IOA office for their help during the 2010/2011 presentation year of the Diploma.

Project titles 2010-11

Salford

Treatment of a studio live room on a budget

Enclosure design and calculated insertion loss

Noise risks to cyclists

Reverberation time: measurement vs prediction

The inference of varying background noise on sound insulation measurement

Methods of Lmax analysis for external building fabric design within city environment

Noise exposure of employees in a garage workshop

The sound of silence

Assessment and performance maximisation of Sonata Acoustics porous absorbers

Occupational noise control

NESCOT

A review of combined road traffic noise levels form A4 and M4 in Brentford using Defra noise maps

Are we aware of the effects if sub physical damage through stress induced by noise?

Hyde Park Concert noise monitoring and minimising complaints

Evaluation of performance of a roadside barrier: A comparison of objective and subjective data

An investigation into the noise produced from deliveries to supermarkets

Acoustic treatment to improve sound reproduction in a small room for the purpose of mixing recorded music

A development and commissioning process of a large sliding acoustic door

An investigation into the noise impact of anaerobic digestion facilities

Leeds

The acoustic treatment of a home studio

Noise impact from the Adhan

Suitability of static exhaust test using Lmax on motorcycle tracks

A study for the desirable acoustic features of a home cinema room

Analysing the acoustics of Cannonball Studios

Recording studio acoustics; a case study

The accuracy of façade correction values and the free-field representative distance

An investigation into noise exposure levels in a children's play facility

College rock/pop venue analysis

Noise abatement technology on heavy plant in surface coal extraction

Noise contour map of licensed premises in Kingston upon Hull

The acoustic treatment and measurement of an acoustic listening space

An investigation into low frequency noise

University of the West of England

Variations in an acoustical feature of a new born baby's cry

Predicting, measuring and assessing noise from a Robinson R22 helicopter

An investigation into the effect of damping on different thicknesses of metal

Investigation into the effect of paper on notice boards absorption

Performance of micro-perforated panel absorbers

Uncertainties of employing light aircraft certification to estimate actual noise exposure

The impact of road traffic noise arising from development within established residential areas

Investigation into the implications of the use of an acoustic screen to manage drum noise

An extreme environment stethoscope

Development of practical exercises to investigate the characteristics of side branch resonators

Derby

Hearing protection in the live event industry

Movable walls: production methodology

Noise levels from kerbside glass collection

Drive-by test at Donington Park race track

Suitability of BB93 to assess existing buildings

continued on page 16

Diploma Examination 2011 - *continued from page 15*

Critical assessment of noise impact of bird scarers
Friction modifiers and acoustic roughness of rails
Tonal correction feature of BS4142
Classroom acoustics and BB93
Comparison of predicted and measured reverberation time
Airborne noise and impact testing
Measurement of low level noise
Drifting at Santa Pod raceway
Assessment of perception of movable walls
Speech intelligibility in Masonic temples
Relationship between music type and annoyance
Noise impact of night time deliveries

Distance learning Bristol

Assessment of the effect of acoustic reflection attributed to a façade

Distance learning Ulster

Acoustic effect of the use of dual muffler diesel genset
Characterisation of diesel power generator set
Noise levels at 2 domestic dwellings vicinity M1 motorway
An acoustic evaluation of a two-storey entertainment venue
2 stroke v 4 stroke lawnmowers
Occupational noise exposure of workshop employees
Noise nuisance arising from concrete batching plant
Assessment of hearing damage in meat processing factory

Distance learning St Albans

A low cost field investigation into the effect that void depth has on the sound absorption of suspended ceiling tiles
Comparison of the noise levels inside a vehicle for two different concrete road surfaces
The variance in the acoustics performance of studio theatres for different stage formats
Building and commissioning an acoustics laboratory
The guitar as a vibrating system
An investigation into the location of a returns air grille in a fan coil unit system
Airborne and impact sound insulation of lightweight floor and ceiling constructions
The comparison of road traffic noise measurement
Street noise at varying heights due to urban canyon width
A study of noise from rapid hand-dryers in toilets

Distance learning Edinburgh

Investigation and comparison of CRTN with WHO guidelines for community noise, using internal and external property measurements
The impact of the smoking ban on the noise pubs and clubs in South Tyneside
Investigation into the acoustic directivity of a small wind turbine
The effect of wind direction on long term predictions of wind farm noise
Effects of anthropogenic noise on protected species
Measure effectiveness of prototype silencer of leisure motorbike
Propagation of noise from wind turbines

List of successful candidates 2010-2011

Distance Learning (Bristol)
Southby H R
Williams S

Distance Learning (Edinburgh)
Bothwell C
Burrell K
Flynn C
Lemieux F M
McClung J G
McKay R
Price J
Smith N

Distance Learning (St Albans)
Arnold A J
Barnfield S M
Bronka M A
Cope J T B
Lewis G
Parker S J
Pittam N J
Rutson-Edwards A T
Stickland I E
Symons P J
West I

Distance Learning (Ulster)
Abu-Khiran E
Boyle M
Callaghan S
Davis B
Henry R G
McGuckin J T

Leeds Metropolitan University
Canavar T
Ellison R M
Golightly M R
Hancock A R
McCollin C
Mosley B J
Pilkington-Doherty C L
Rush C A
Sidebottom T E
Smith A M
Smith S A
Thompson P
Williamson C A

NESCOT
Broom I
Crockford J V
Dean T
Le-Vallee H
Morris L
Rendell L R
Simmons S
Unwin A

University of Salford
Barr A D
Bowden L
Harbon D
Iafrati R
Kavaney L J
Kneller F
Lombard L
Pope K
Todd A S
Urquhart S C

University of Derby
Bignell S C
Bolton D J
Buttle T R
Cawthorne T
Crabb T A D
Edge S E
Frankland C J
Green R H
Hainsworth P I
Liston K I
Lynch M J
Morris R S
Nash P M
Rowan N J
Stevenson P R
Suschitzky K S
Walters DM
Young C

University of the West of England
Davidson R D
Dearing M P
Dickson J P R
Fox R B
Henry D
Huntington P D
Lee D
Potter V L
Shears R P
Tofts J G W

IOA Certificates of competence

Certificate Name: Environmental Noise Assessment
Exam Date: 21 October 2011

Bel Educational Noise Courses
Millar S N

University of the West of England
Anderez-Amorrosta A
Burgess D R
Chillcott N
Da Silva T
Gill R L
Harry S J
Hladkij J R
Keith-Hill R M
Lewis C H
Megigitt J
Mudge D E
Tournier G A J

Colchester Institute
Barker C
Capps E J
Cleary M J
Cooper D J
Demonty A J
Elliott J
Henry S J
McMorrow J A
Sheridan S M
Smith C W A
Thompson N
Thompson R
Wilson J

University of Derby
Bame T
Bradbury K
Day P
Painter K
Troughton C E
Yeowell S L

Liverpool University
Brookman R
Cooney M F
Durrant H L
Fletcher M
Hill J M
Hines-Randall S
Jarvis M E
Oliver E
Paton A J
Quinn C A
Richard R A

Moloney & Associates
Brady P
Lawlor B A
O'Connor A
O'Dea D
Roche T
NESCOT
Bamford A S
Barratt Z
Clarke C J
Crutchley M E
Munn S
Zakar S

Shorcontrol Safety Ltd
Diggin B
Meaney O'Neill F
Reidy M C
Tarrant R

Southampton Solent University
Docwra J L
Jude B J
Morgan E
Young S A

University of Strathclyde
Cormack E
Gillan S
Hill B
McGhee M
McIntosh E
Moisey J W
Preston H
Sneddon S E

Certificate Name: Workplace Noise Risk Assessment
Exam Date: 4 November 2011

University of Derby
Gatensbury L
Holmes D
McKeever S
Smith A A
Yates R A
EEF Sheffield
Bell I
Bilton K M
Rawdin D J
Rhodes K M

Leeds Metropolitan University
Crowther M A
Dowson A J
Harvey N C
Kelly P
Leather C

EEF Melton Mowbray
Clarke M P
Kemp B J
Steele R J
Woodcock D

Edinburgh Napier University
Cobb J
Daly S
Green M

Rapid Results College
Clutten C
Horsell K A

Shorcontrol Safety Ltd
Dillon C
O'Connor D
O'Reilly S

A message from the Editor

Charles Ellis

As I hope most readers will be aware by now, I have taken over as editor from Ian Bennett who bowed out with the publication of the last issue after 11 years' distinguished service.

I am eager to maintain the standards set by Ian and, where possible, improve the magazine again so it becomes an even more indispensable "read" for members. With the help of a small technical committee, I am looking to ensure that the content reflects what is happening not just in the Institute but in the world of acoustics generally. To this last end, technical contributions from members on all areas of acoustics, noise and vibration are particularly important, so please do keep them coming.

I am based at the Institute's offices in St Albans, where I will be very happy to discuss your ideas and suggestions to take forward what is your magazine, so do call me on **01727 848195** or drop me a line via **charles.ellis@ioa.org.uk**

Charles Ellis

Top noise awards for IOA members

Institute scores highly at 2011 John Connell Awards

Four senior IOA members – Keith Attenborough, Bernard Berry, Jian Kang and Bridget Shield – were among the winners at the Noise Abatement Society's 2011 John Connell Awards. The awards, now in their 11th year and dubbed the "Noise Oscars", were announced at a ceremony at the Houses of Parliament.

Two lifetime achievement awards went Bernard Berry and Bridget Shield in recognition of their "outstanding contributions to raising the profile of noise pollution as a critical environmental issue" and for "working tirelessly over the course of their careers to effect solutions for the public benefit".

Professor Bridget Shield, IOA President-Elect, has been recognised for her continuing work on the effect of noise and poor acoustics on children and teachers in primary schools. Bridget's research has informed new legislation on the acoustic design of schools and, in 2003, she was appointed by the Department for Education and Skills, as editor of Building Bulletin 93 which contains the statutory acoustic performance specifications for schools, under the Building Regulations.

Bridget, Professor of Acoustics in the Faculty of Engineering, Science and Built Environment at London South Bank University, has many years' experience of teaching, research and consultancy in environmental and architectural acoustics. She is the author of more than 70 published papers and her research interests have included prediction of industrial noise, community response to railway noise, concert hall acoustics (with Professor Trevor Cox), and annoyance caused by low frequency noise.

Bernard Berry has been awarded the accolade for his continuing work and expert advice on the effects of noise. He has been a consultant to industry, Governments, local governments, the EU and has collaborated on research projects with a number of organisations. He is an Adviser to the World Health Organisation [WHO] European Centre for Environment and Health [ECEH] in Bonn, and a member of the WHO working group on aircraft noise and health.

He is Chairman of the main British Standards Institution [BSI] Technical Committee on Acoustics. He was IOA President from 1996-1998 and was the Institute's Vice-President for International Relations from 2001 to 2007. In October 2009 he was presented with the Institute's Award for Distinguished Service – "for his outstanding contribution to the life of the Institute". In April 2010 he was elected a Distinguished International Member of the Institute of Noise Control Engineering of the United States of America.

The third IOA member to be honoured is Professor Keith Attenborough, who was part of a team that received the innovation award for the Organ of Corti project, which recycles sound from the environment, enhancing or reducing the frequencies to create a new soundscape for the listener.

Named after the organ of hearing in the inner ear, it uses the acoustic technology of sonic crystals to accentuate and attenuate frequencies within the broad range of sound frequencies present, like road traffic or falling water. By recycling surplus sounds from our environment, it offers new and pleasurable ways of listening to what is already there.

Keith, IOA Education Manager and Open University Professor of Acoustics, described it as: "a meeting of physics and art".

It is the second time the Organ has received public recognition – last year it won a £50,000 new music prize.

Keith said the organ's arrangement of four metre tall acrylic poles "does interesting things to sound". They enhance or reduce certain characteristics of the sound and, he said: "They get people to listen to sound a bit more and invent their own kind of music as they move through the sculpture."

The fourth IOA member to receive an award was Professor Jian Kang, of the University of Sheffield, who won the Silent Approach™ Award for Soundscapes in urban open public spaces. This award encourages development in the area of reducing noise to the benefit of the community whilst enhancing the environment.

Open public spaces are important elements of urban areas. However, in many such spaces the quality is significantly affected by the unsatisfactory soundscape, which could be "too noisy", or "too vibrant", or "too quiet". A soundscape approach, however differs from conventional noise control engineering, and represents a paradigm shift in that, it combines physical, social and psychological approaches and considers environmental sounds as a "resource" rather than a "waste".

In recent years, Jian has systematically carried out a series of pioneering projects, funded by the University of Sheffield and institutions across the globe, to research the improvement of soundscapes in urban open public spaces, with a series of outcomes, including: Tools and Design Guidance published by the EU; Computer modelling simulations; and a Soundscape Database of over 10,000 field interviews for predicting users' perception of and developing evidence and understanding of soundscapes in urban open public spaces. His work has changed the way that soundscapes in the public realm will be perceived, understood and developed inspiring a new generation of architects, policy makers and urban planners.

Dr Shahram Taherzadeh (left), of the Open University, receives the innovation award from Mike Weatherley MP, of behalf of Keith Attenborough, who was unable to attend. Frances Crow (right), of the Organ of Corti team

Mark Lindquist (left) receives the soundscapes in urban open public spaces award on from Bob Neill MP behalf of Professor Jian Kang who was unable to attend

Bridget Shield receives her award from Daniel Instone, Head of Atmosphere and Local Environment Programme at Defra

Bernard Berry with Daniel Instone, Head of Atmosphere and Local Environment Programme at Defra

IOA Membership Committee – new members

The following were accepted by Council on 1 December for membership of the Institute of Acoustics in the grades mentioned, following the recommendations of the Membership Committee on 3 November.

Member

Bracher C R
Dawood A L
Elford D
Flanagan N
Gedge K A
Gibbs G M
Heath A T
Hillion B
Hine G R A
Ho C K Y
Jackson T
Lambert-Porter R
Levet T
Mohamed Zamzam M
Murphy M J
Ryder D C
Sloan M H
Thomson G E
Wright D J

Associate

Barry G
Butler B
Clarkin P
Cope J
Dean T
Goward N
Jackson K
Koufoudakis E
Le Nost G
Mahtani Mirchandani R
Pritchard D J
Timothy H

Affiliate

Doutsios D

Technician

Barbour A
Bradford C
Dunlop J J
Evans D K
Staines A K

Student

Evans J
Palmer S
Rhiana F

Refrigeration system scoops IOA-sponsored award

Low-noise food unit is a technological marvel

A "quiet" in-transit refrigeration system has won a major IOA-sponsored award that applauds the vital role that industry can play in reducing noise pollution in the environment.

FROSTCRUISE™ manufactured by Linde was named as the winner of the technology section in the Noise Abatement Society's 2011 John Connell Awards, dubbed the "Noise Oscars", which were announced at a ceremony at the Houses of Parliament. The presentation was made by IOA President Trevor Cox.

Described is an efficient, economical, cryogenic in-transit refrigeration system, it provides an eco-friendly solution for the transportation of perishable chilled and frozen food, based on the use of liquid nitrogen (LIN) as the refrigerant. FROSTCRUISE™ is low-noise and operates much more quietly than diesel-operated refrigeration systems and can therefore be used to deliver at night or at early hours.

Highly commended in this section was Echo Barrier H1 and range of products. Echo Barrier is a temporary acoustic barrier designed for use on major construction projects to reduce problems of excessive noise pollution from work sites. The Echo H1 acoustic barrier literally soaks up sound around it rather than reflecting it, attenuating noise by up to 30dB. Designed for quick and easy installation on standard Heras fencing or similar, the H1 is aimed at sites where it is important to reduce noise levels and maintain good community relations, such as in residential and public locations.

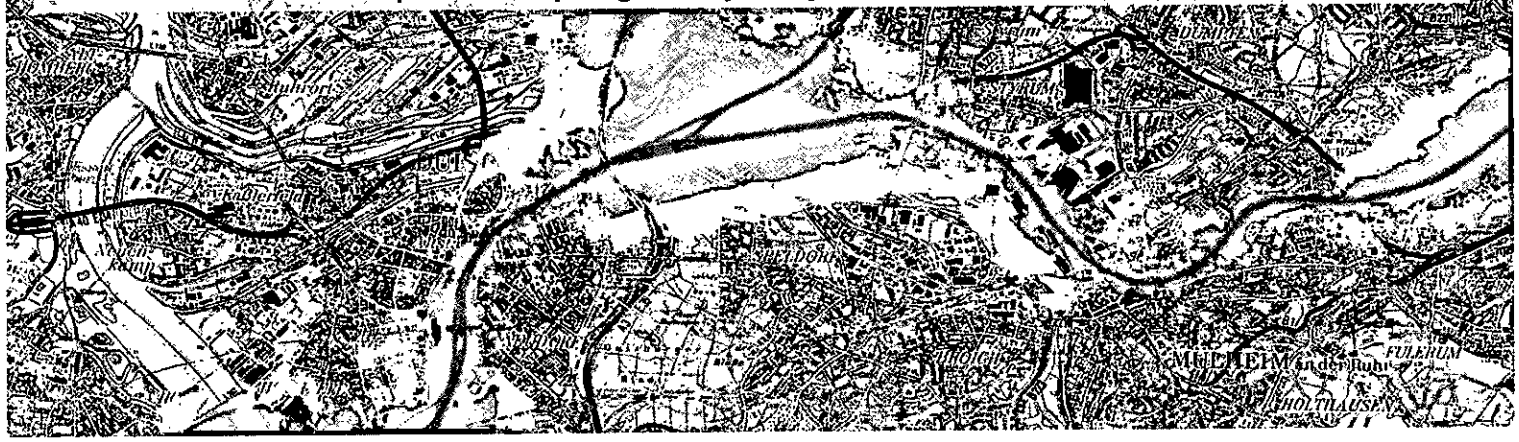
The benefits of reducing on-site noise using Echo Barriers are considerable, including reducing the likelihood of noise complaints, creating a more productive working environment, and extending site operating hours and ultimately significant cost savings.

Simon Handley (left), of Linde, receives the technology award from IOA President Trevor Cox

The World's Biggest Noise Map.

SoundPLAN 7 was chosen for the world's biggest noise map, the railway noise map of all Germany.

Although SoundPLAN is already the most flexible and one of the fastest programs of its kind, version 7 represents another big step forward for noise control software. This version introduces the new calculation core employing SoundPLAN's Dynamic Search scanning method. It is now possible to calculate huge noise maps with complex geometry using modern simulation standards.



SoundPLAN Version 7.0

Incredibly Fast

The new dynamic search method makes it the fastest noise control software on the market to our knowledge.

Incredibly Accurate

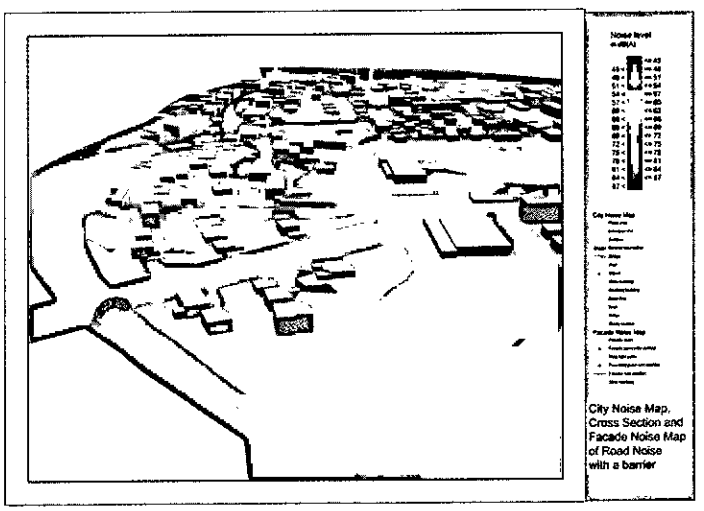
Mesh maps, hot spots, dynamic search and extensive testing for utmost accuracy according to 50+ standards.

Incredibly Useful

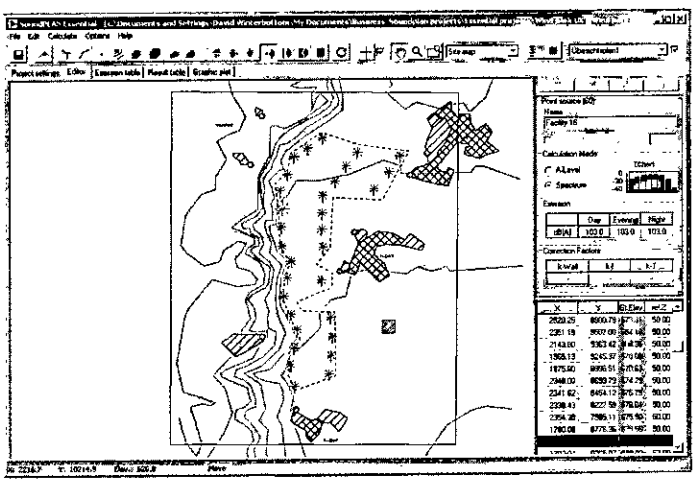
Stunning Graphics are easy to use. Spreadsheet for multiple results and automation of analysis such as DMRB. Documentation with advanced formatting. User definable templates and much, much more.

Incredibly Popular

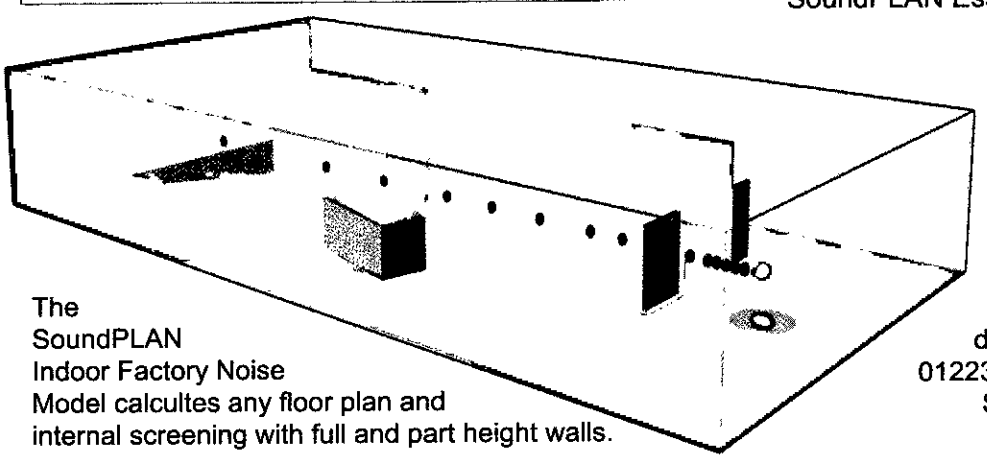
Nearly 5000 users in 50+ countries. Used by governments, consultants and researchers. Available in European, Asian and soon Arabic languages.



City Noise Map, Cross Section and Facade Noise Map of Road Noise with a barrier



SoundPLAN *Essential* is a compact version for occasional users and less complex projects with a very competitive price.



The SoundPLAN Indoor Factory Noise Model calcultes any floor plan and internal screening with full and part height walls.

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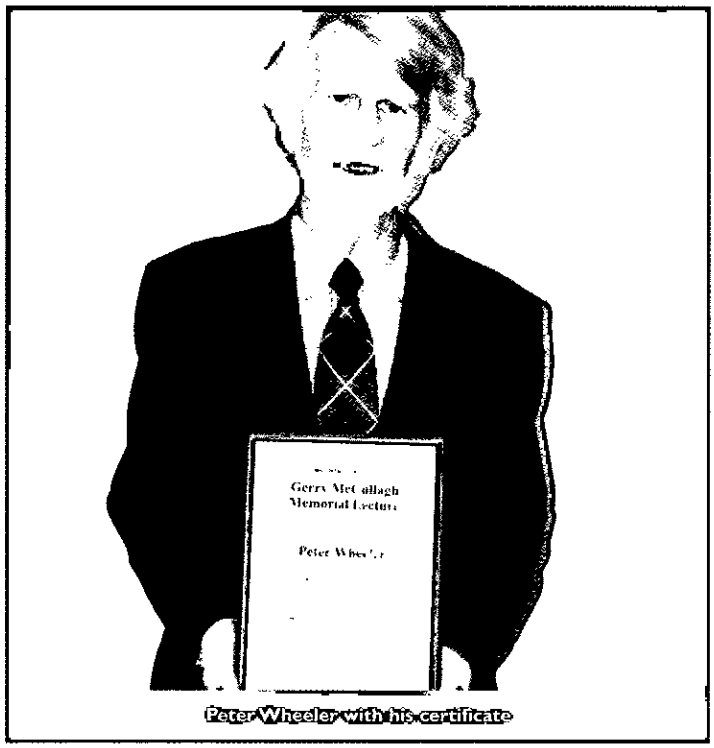
SoundPLAN

Peter Wheeler delivers the Gerry McCullagh Memorial Lecture

Irish Branch meeting Report by Martin Lester

The Gerry McCullagh Memorial Lecture was initiated by the Irish Branch Committee to provide a means to remember that Gerry promoted acoustics throughout Ireland. To mark his work in education, the branch presents a certificate to the best performing Institute of Acoustics Diploma student resident in Ireland. As the final marks for the project are not known at this time, the award for the Diploma 2010-2011 will be presented later – most likely next year's AGM.

The sixth lecture was given by Peter Wheeler, now "retired", who has had a varied career in both industry and academia. Peter is a Past President of the IOA and is still actively involved with the Institute, managing the Engineering Registration Scheme.



Peter Wheeler with his certificate

Peter's talk took us through his early period in education, during which he read physics and electronics at Imperial College, subsequently specialising in acoustics and audio signal processing. Following this he spent time as a part-time MSc student with Geoff Leventhall and Edgar Brown at Chelsea. Peter took the option to work for the BBC in broadcast engineering, and then joined the Wolsfon Unit at ISVR, where he established a research group in electroacoustics and audio communications for industry and government departments.

His first major project at ISVR was Skyshout, the Ministry of Defence development of an enhanced version of a helicopter-mounted Tannoy system used in Ulster for crowd control in order that the helicopters could fly at a higher altitude and were therefore less likely to be subject to rifle fire from the ground.

Around 1976 Peter became involved in a project which was to occupy the next 15 years - the active control of noise in flying helmets. This involved an audio feedback system for reducing low frequency noise under the ear-cups of a flying helmet which included a relatively simple analogue electronic feedback loop, using a sensing microphone placed in the earcup. However, due to huge variations in the low frequency sound pressure level under the earcup the feedback circuitry became swamped. Peter took over the project from early work by the RAF and managed the process through design, flight trials, and eventually, into production and service with UK and NATO armed forces, in aircraft and in fighting vehicles.

Following on from this, the patent and know-how was licensed to Racal Acoustics in 1986 and Peter joined RAL as director and part of the technology transfer, having spent 13 happy years at ISVR.

This work was of such interest that it featured on BBC TV's *Tomorrow's World* programme, which Peter now has as a MPEG movie file, and we were given a viewing.

While at Racal, in 1989, when Chris Rice was President, he worked with Chris and Peter Lord to set up our Chartered Engineer Registration scheme, initially via IMechE, with the support of Frank Shaw, a retired Rolls-Royce motor engineer.

Peter's contact with Peter Lord (Professor at the University of Salford) led to Peter being appointed Head of Department of Applied Acoustics at Salford in 1990 when Peter Lord retired. During this time he served as President of the IOA from 1992-94.

Following his role in the management of the merger of the University of Salford and Salford College, Peter became Pro-Vice-Chancellor for business and external relations in 1995, hosting visits by members of the royal family, business leaders and media personalities, and working with the other three Greater Manchester universities in developing international activities.

Peter has been active in national, European and international standards development in acoustics and noise for more than 30 years, and, since retiring from Salford, he has continued to act as an advisor to Government departments. He is a Chartered Engineer, a Fellow of the Institution of Electrical Engineers, and Honorary Fellow of the IOA and was a founder member of the European Acoustical Association.

Peter was presented with a certificate in recognition of giving this year's Gerry McCullagh Memorial Lecture by Martin Lester, Chairman of the IOA's Irish Branch.

IOA sets up wind farm working group

Team to produce good practice guide

In response to a request from the Department of Energy and Climate Change (DECC), the Institute of Acoustics has set up a working group to take forward the recommendations of the Hayes McKenzie report on "Analysis of How Noise Impacts are considered in the Determination of Wind Farm Planning Applications" Ref HM: 2293/R1 dated 6th April 2011.

The members are: Richard Perkins, Parsons Brinckerhoff Ltd. (Chairman); Matthew Cand, Hoare Lea Acoustics; Robert Davis, RD Associates; Malcolm Hayes, Hayes McKenzie Partnership; and Chris Jordan, Northern Group Systems (Environmental Health).

The group's aim is to review the available evidence, and to produce good practice guidance on wind turbine noise assessment. The group currently expects to consult on the guidance in spring 2012, with the final guidance being published in summer 2012.

Richard Perkins said he wanted to thank the large number of people who volunteered to join the group, but it was not possible to involve everyone.

However, the group is looking to establish a peer review group in spring 2012 to review the document prior to consultation.

Anyone who would like to contribute with information (research papers, data, inquiry proceedings etc.) that may be of assistance to the group, or would like to help with the peer review, should contact him at **Perkinsr@pbworld.com**

How to deal with uncertainty in the planning process

London branch meeting Report by Bob Peters

Colin Cobbing and Bob Peters gave a joint presentation to London branch on dealing with various aspects of uncertainty as part of the planning process. The very large attendance (approximately 60 people) indicated they had chosen a topic of great interest to many members. They outlined the nature of the EIA process and the many types of uncertainty which had to be dealt with before an assessment of impact could be determined.

Bob gave an account of the history of the appreciation of uncertainty in acoustic field measurements and explained how such uncertainties could and should be estimated, and went on to show that similar estimates in of uncertainty in noise level predictions could and should also be made. Colin then explained that the variability of human response to noise and vibration gave rise to another significant source of uncertainty in the estimation of impact. He then turned to the various other sorts of logistical uncertainties that can bedevil the development process, particularly in the case of large scale development which can span several years from initial concept design through to final design, including changes in the design of the scheme and the exigencies of the construction process. He argued that there is a need to assess all aspects of uncertainty and report the findings within an overall framework so that decision makers and stakeholders are given a proper appreciation of the overall risk of over or under-estimating the likely significant effects. Dealing with uncertainty within an overall framework will also help the promoter and the planning authority to identify measures to: a) prevent significant impacts, and b) mitigate impacts on local communities if it was found that, during the operation of the scheme, the EIA had underestimated significant impacts.

The present way in which planning developments are handled in the UK can be adversarial in nature. Local planning authorities will adopt an understandably defensive position if they believe that the cumulative uncertainties have not been addressed properly and that they and local communities will be straddled if the EIA fails to identify all the significant impacts. It is also understandable that developers will be reluctant to engage on such complex matters if they believe the local planning authority is unlikely to adopt a measured and balanced approach.

Colin argued with conviction for a more consensual approach to the planning inquiry process, in which uncertainties in the magnitudes of the final impact were reported in the environmental statement *Dealing with uncertainty within a coherent framework* presents opportunities for developers to engage with the planning authority to agree as to how these might be dealt with before the scheme is permitted and, post development, if indeed it turned out that the impact had been underestimated. The tone of the lively discussion which followed Colin's presentation indicated that this argument met with agreement by a significant part of the audience and that there was, indeed, need for significant improvement within this aspect of EIA.

London branch would like to thank Colin and Bob for taking time out of their busy schedules to give a very interesting presentation, which proved to be extremely popular. The committee would also like to extend their thanks to WSP for providing the venue. Topics and speakers for the evening meetings are generally organised by the committee, but they always welcome new ideas and suggestions for future presentations. If you have any ideas or suggestions, or may even like to give a presentation yourself, then please contact Nicola Stedman-Jones on **stedmann@rpsgroup.com**

Acoustics 2012

Nearly 850 abstracts submitted

The joint SFA/IOA conference, which is to be held at a modern conference centre in Nantes 23-27 April promises to be an important and interesting event.

At the close of the submission deadline, 847 abstracts had been submitted distributed between general topics as listed in Table 1.

During the opening ceremony on 23 April there will be two plenary speakers nominated respectively by IOA and SFA. The IOA nominee is Professor Kirill Horoshenkov who will talk on "Acoustical monitoring of water infrastructure" including results from projects funded by EPSRC and industry concerned with water flow in pipes and channels. The SFA nominee is Noureddine Attalla who was joint author with Jean-François Allard of the latest version of the book on "Sound propagation in porous materials".

General topic	Number of abstracts
Physical Acoustics and Underwater Acoustics	260
Musical Acoustics	95
Measurement and Instrumentation	90
Noise and Vibration Engineering	74
Environmental Noise	69
Aero and Hydro-acoustics	66
Architectural and Building Acoustics	57
Sound Perception	55
Electroacoustics	32
Hearing and Speech	19
Other topics	16
Animal Bioacoustics	14
Total	**847**

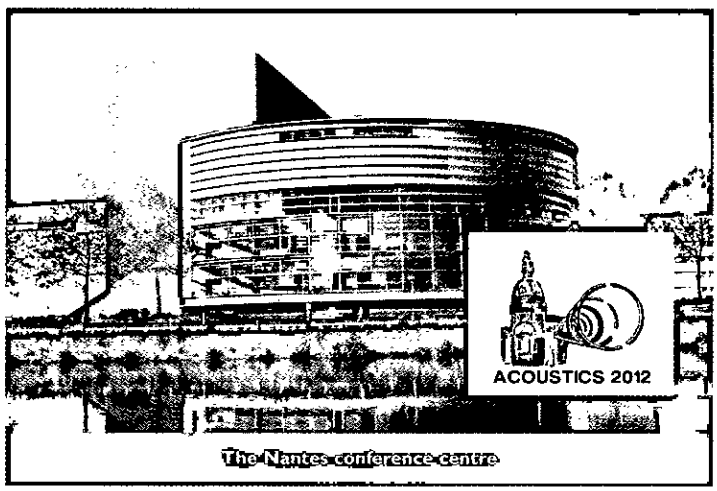
Table 1

Submitted abstracts distributed between general topics

On each of the other four days of the meeting there will be two concurrent keynote talks. The speakers nominated by IOA are Dr Stuart Bolton (Purdue University, Noise Control Materials), Professor Robin Cleveland (University of Oxford, Biomedical Acoustics), Dr Carl Hopkins (Liverpool University, Tyndall Medal Lecture) and Professor Yui Wei Lam (University of Salford, Rayleigh Medal Lecture). The speakers nominated by SFA are Professor Murray Campbell (University of Edinburgh, Musical Instrument Acoustics), Professor Marc Deschamps (Université Bordeaux 1, Laser Ultrasonics) and Professor Daniel Juvé (Ecole Centrale de Lyon, Aeroacoustics). There is also the possibility of a presentation from Professor Barry Truax (School of Communication & School for the Contemporary Arts at Simon Fraser University in Canada, World Soundscapes Project and Composer).

Apart from the chance to see the historical city of Nantes, there will be official congress tours of Muscadet wine country, the fortified coastal town of Guérande and the salt marshes of Brière and a boat cruise congress banquet. Registration is possible until 2 April: visit **http://www.acoustics2012-nantes.org/index.php/en/congress/registration.html**

The conference will feature an accompanying technical exhibition highlighting the latest advances in products for all fields of acoustics. Dennis Baylis, IOA Advertising Manager, who is co-ordinating the UK side, said: "It is a great opportunity for companies to get exposure, not only during the days of the conference but also in the time leading up to it." To book exhibition space go to **http://www.acoustics2012-nantes.org** or contact Dennis at **dennis.baylis@ioa.org.uk**



The Nantes conference centre

IOA history project

Your memories wanted

What memories does the word Windermere bring back for IOA members? This is just one of the questions that former IOA President Geoff Kerry and Vice-President Groups and Branches is posing as he continues with the task of compiling a history of the Institute to mark its 40th anniversary in 2014.

In a review of progress since the project was officially launched at the Senior Members' Group inaugural meeting in January 2011, he said: "Although there is a huge amount of information on record, we still need to draw out the memorable aspects of the Institute's life and in addition to undertake a specific task, suggested by current President Trevor Cox, to bring in the 'human' side of the Institute's history by adding anecdotes and photographs.

"Many members must have photographs of past conferences or tales to tell of various activities. If I mention 'Windermere' surely some of you must have a tale of bonfires or boat rides on the lake in bad weather or even an opinion on the taste of the late Gerry McCullagh's 'hooch'. If you have then let either me (**geoffkerry@tiscali.co.uk**) or our publicity officer, Charles Ellis (**charles.ellis@ioa.org.uk**) have the details, copies of the photographs or preferably both."

Geoff said the first task had been to find a way of providing an effective timeline on which the various projects that the Institute has undertaken over the years could be anchored. Past Chief Executive Roy Bratby, Senior Members Group Chairman Ralph Weston and past President Peter Wheeler had volunteered to assist with this aspect and they were currently looking through the Council minutes and listing against date, the major events.

Another past President Alex Burd, who is a member of the Physical Societies Acoustics Group committee, which combined with the Society of Acoustic Technology to form the British Acoustical Society and eventually the IOA, volunteered to look into the early days of the acoustics' profession in the UK. Chris Rice, also a Past President, was also looking at the history of what was a crucial time in the maturing IOA when the enthusiasm to develop the professional institute nearly got ahead of the ability to cover the costs.

The second task had been to persuade members to volunteer some assistance, in the first instance, to search their own records and their own minds for information. This task has been slow to get under way.

Some members have said that they can assist but will require time to dig into their records, some others have volunteered their services with proof reading etc. and we will get back to these in due course. An appeal has gone out to the chairmen and secretaries of all Groups and Branches to search their own records or to chase those founder members whose ideas and enthusiasm created the group and branch structure we have today.

Citations

Dr Steven Dorney: IOA Award for Promoting Acoustics to the Public

Steve Dorney holds degrees across the traditional arts/science divide, with a first-class BA and subsequent PhD in English Literature from the University of Southampton and an MSc with Distinction in Intelligent Systems from Sussex University. This multi-disciplinary background together with years of experience in teaching and community engagement proved an ideal mix for science outreach.

Steve joined the Institute of Sound and Vibration Research (ISVR) at the University of Southampton in 2006 as an Outreach Coordinator and Science Communicator. Although Steve has no formal technical or academic background in acoustics, he rapidly gained a broad insight into the subject, related topical issues and current research. He earned the good will of ISVR staff and students, and widespread buy-in to his outreach schemes which have included acoustics exhibits at the Royal Society Summer Exhibition and Cheltenham Science Festival, alongside a touring road show and substantial acoustics contributions to National Science and Engineering Week.

He has worked closely with countless partners in promoting the importance and science of acoustics to all ages, from nursery groups to the University of the Third Age, but most notably to children and teachers in primary and secondary education, on- and off-campus and in science learning centres. He has been particularly successful in making interdisciplinary links with acoustics across the curriculum so that acoustics awareness and knowledge spreads beyond the traditional science class. In pursuit of new ways to enthuse people about acoustic science, he has built lasting partnerships with other science communicators and an eclectic mix of dance companies, theatre groups, artists and musicians.

Steve's gifting for outreach extends to enthusing and facilitating others in its practice. At ISVR, Steve introduced a training programme to develop outreach skills which is now seen as a best practice model, and in 2008 Steve received the University of Southampton's Vice Chancellor's teaching award for his public engagement achievements. He is now Public Engagement Tutor for the engineering faculty as a whole but continues to promote all things acoustical.

For providing inspiration to a new generation of acoustic talent, the Institute is pleased to award Steve Dorney the Award for Promoting Acoustics to the Public.

Bob Walker: Peter Barnett Award 2011

Of the acousticians who work with architectural acoustics, recognition is mostly afforded to those working in concert hall and perceptual domains. Work in small room acoustics is often under-recognised, and given that most of us listen to speech and music through loudspeakers, small-room acoustics plays a major role in our listening life. Bob Walker is an acoustician whose career-long work with small rooms has greatly enhanced our understanding of listening environments.

Bob's work has helped to shape acoustical design throughout the world. He has been credited with the "controlled image" design for control rooms, which was deemed an original contribution to the art.

In particular, as a senior engineer with the BBC, Bob's work has focussed on studio listening environments for broadcast. The foundation for that work was his desire to create accurate and comfortable listening situations for control room engineers.

Acknowledging that acoustics is both art and science, Bob sees acoustics as having artistic aspects, and is drawn to the process of analysing, quantifying and understanding sound that is heard in small room environments.

Bob spent almost 38 years in the Research Department of the BBC, in a team that was given some freedom to research various topics in control room acoustics. From his commencement with that team to the present, Bob has authored many papers for IOA, AES, Internoise and ICA conferences. His work is often cited by other prominent workers in the field of room acoustics.

Another important aspect of Bob's work was the investigation of vibration-isolation methods and in 1985, he led a BBC team that investigate and develop methods to properly isolate studios from the vibration of underground trains. Included in that work was development of an accurate model to predict noise levels from ground borne vibration. Bob then authored a number of papers on the topic of vibration isolation.

Bob's talents also extend to video signal processing and video watermarking – embedding encrypted messages by steganography. Before they were commercially available, he designed and built a digital video processor for the BBC, and in the latter stages of his career, he also designed and built a demonstration watermarking machine for the BBC.

One of the prime foundations of Bob's professional work has been his great attention to technical detail. His papers are both rigorous and useful, and that rigour not only provides confidence in the results but provides an important educational aspect to his publications.

Bob is keen to educate his listeners, particularly users of acoustic test equipment, about the pitfalls of relying on the computer analysis without understanding the fundamental limitations of the method. He has conveyed his thinking at numerous AES and IOA conferences in papers that are easy to understand and leave the reader richer for the experience.

He has also served on standards committees of the ITU (formerly the CCIR) and EBU for some 15 years and believes that recommendations arising from those committees have made a difference to the world of audio broadcast.

Bob Walker has also given his time to the Institute, and in 2006, he was presented with its Distinguished Service Award. He has been keen to share his enthusiasm with others from early on and found that the Electroacoustics Group of the Institute was an ideal forum for this. He has been a great supporter of the Reproduced Sound conferences from their inception until the present day. He has served on the Electroacoustics Committee for a great number of years and was chairman of the committee for three years.

Bob Walker is a worthy recipient of the Peter Barnett Award, and we commend him for his very important contributions to the art and science of listening room acoustics, and his willingness to share his knowledge.

Steven Dorney (right) receives his award from IOA President Trevor Cox

Bob Walker (left) receives his award from IOA President Trevor Cox

IOA scores at 'Hornets' nest

Football club careers event hits goal

Once again the Institute of Acoustics has been spreading the word about just how rewarding a career in the varied world of acoustics can be.

This time is was at the 'Your Future Fair' careers day at Vicarage Road, home of Championship League club Watford FC (the "Hornets").

The IOA had a display stand there, along with several other organisations ranging from the Army to universities and colleges to training providers, those concerning apprenticeships to Mothercare.

It was the ideal platform for 13-19 year-old students from local secondary schools and colleges – and their parents and teachers – to learn first-hand how a career as an acoustician, sound engineer or consultant is seriously worth considering.

In turn for the IOA, the event provided an excellent opportunity to support young people living just a few miles from its offices in St Albans.

Over the event's afternoon and evening sessions, several hundred students attended, with the IOA stand doing brisk business with many interested students asking questions and wanting to know about the Institute and what a career in acoustics might entail and lead to. Significantly their parents were especially interested.

The IOA team handed out a considerable amount of Institute and careers-related literature to intrigued students, with the "on-trend" post cards proving most popular with the young attendees.

Additionally, the Institute was able to highlight the range of professionally recognised courses for those interested in working in any aspect of acoustics.

Passionate

Alex Krasnic of ZBP Acoustics organised the IOA's attendance through Setpoint Herts which promotes science, technology, engineering and maths (STEM) in Hertfordshire schools, and HCS, the specialist provider of career management and development services.

A STEM Ambassador, Alex attended the careers event. He is passionate about all things acoustics and keen to encourage youngsters to think about the impact sound has on us all, its dynamics and measurement. Brimming with enthusiasm, he draws on his own experiences, roles and career path – from university to his present role – to stress the profession's many positive aspects, and to get students thinking about what the acoustics profession can offer.

Alex Krasnic explains what a career in acoustics can offer

Alex gets involved with many such school careers events and says: "To the outside world it may seem surprising that acoustics offers so much for students, for instance at degree level and in their subsequent careers.

"Yet, it's so diverse and can take young people into all kinds of areas.

"That's a key message we aim to communicate.

"Acoustics opens up so many dimensions – and opportunities – as shown by our members' interests, which embrace such aspects as aerodynamics, architectural acoustics, building acoustics, electroacoustics, engineering dynamics, noise and vibration, hearing, speech, underwater acoustics, plus a variety of environmental aspects."

He continues: "What's great is that there's such a 'community' feel to being in acoustics as a career, notably through the IOA's conference and learning programmes and members' openness and willingness to provide solutions to industry issues.

"New blood is as essential to the future of our acoustics profession as it is to any other. We owe it to ourselves to nurture new, young, talent in our field.

"Our aim is to encourage students to at least consider it as a forward-looking, stimulating and rewarding profession – and hopefully join our ranks. It's for our future too. Through the IOA, I'm sure we'll be continuing this commitment to help students with their careers at similar events throughout 2012."

ECUA 2012

Keynote speakers and session chairmen confirmed

Arrangements for ECUA 2102 in Edinburgh are moving ahead fast with the confirmation of keynote speakers and session chairmen (see below).

The event, which is being organised by the IOA, provides a key international forum for presentations on the latest research and developments in hydroacoustical science and engineering.

It was established in 1992 by the European Commission in co-operation with three European Acoustical Societies (IOA; DEGA; SFA) and has become an established and renowned conference series. The 2012 conference will be the first to be held in the UK.

Contributed papers have been invited in all areas of underwater acoustics. The main themes are: Underwater Acoustics; Acoustical Oceanography; Ambient and Radiated Noise; Bioacoustics; Scattering; Communications; Simulation and Modelling; Transducers and Calibration; Measurement and Signal Processing. The conference is organised around structured sessions, which include for:

Edinburgh 2012

European Conference on Underwater Acoustics

Underwater acoustics

Fluctuations and scattering – Barry Uscinski Memorial Session
Keynote: Terry Ewart
Peter Dobbins, Michael Ainslie and Andrew Holden

Seabed interactions: Peter Thorne, Mike Buckingham and Mike Richardson

Volume scattering and bubbly media (tbc):
R Lee Culver and Tim Leighton

continued on page 28

ECUA 2012 - *continued from page 27*

Advances in finite-element & spectral element modelling:
Mario Zampolli and Paul Cristini

Vector acoustics: theory, sensors and applications:
Jean-Pierre Hermand, Tuncay Akal, Sérgio Jesus and Paulo Felisberto

Sonar performance measurement and modelling:
Charles Holland, Dale Ellis and Michael Ainslie

Bioacoustics

Keynote: Peter Tyack

Hearing response: Klaus Lucke

Biosonar and biomimetics: James Flint and Peter Dobbins

Processing of bioacoustic signals: Paul White

Long-term monitoring of marine life: the use of passive acoustic data for quantitative estimates of abundance:
Michel André and John Hildebrand

Behavioural response to underwater sound:
Tony Hawkins, Art Popper and Jakob Tougaard

Impact of underwater sound on marine life: risk assessment and mitigation: Sander van Benda-Beckmann and Martin Siderius

Acoustical oceanography

Seafloor characterisation: Gary Heald and Anatoliy Ivakin

Polar acoustics: Jarek Tegoswki and Sasha Gavrilov

Acoustic mapping for underwater archaeology: Andrea Caiti

Habitat mapping: techniques and applications: Philippe Blondel

Marine GIS and 3d/4d visualisation and mapping: Andrzej Stepnowski

High-frequency midwater mapping: Tom Weber

Marine renewables: mapping and monitoring of devices and their environment: Philippe Blondel and Paul Lepper

Ambient and radiated noise

Keynote: Michel André

Monitoring techniques & long-term trends in ocean ambient noise:
Mark Prior & Ross Chapman

Noise and vibration from marine piling:
Stephen Robinson and Paul Lepper

Operational noise from marine renewables:
Stephen Robinson and Paul Lepper

Radiated noise from ships and surface platforms:
Christ de Jong and Anton Homm

Sensors and calibration

Sonar & transducer test & calibration:
Victor Humphrey and Pete Theobald

Multibeam echo sounder calibration methods: Tom Weber

Transducers: Keith Mayne and Mark Walsh

Communications and signal processing

Underwater communications:
Bayan Sharif, Oliver Hinton and Charalampos Tsimenidis

Model-based signal processing: Douglas Abraham

Target strength and scattering from objects on the seabed:
Duncan Williams and Andrew Holden

Automatic target recognition: Yan Pailhas and Chris Capus

Synthetic aperture sonar: Hans Groen and Michel Couillard

Bathymetry and multibeam sonar: Mirjam Snellen and Dick Simons

Noise correlation processing (tbc):
Martin Siderius and Chris Harrison

Acoustics for oil and gas industry: Robert Laws and Andrew Curtis

Autonomy and underwater sensing:
Kevin LePage, Henrik Schmidt and Yvan Petillot

Maritime security: Andrew Holden and Julian Deeks

Further details about ECUA 2012 can be found at: www.ecua2012.com

What you can get away with 90 per cent of the time!

An investigation into the basic requirements for environmental noise measurement parameters

Report by Simon Bull, of Castle Group Ltd, Scarborough and Chris Gilbert, of Acoustic Associates, Peterborough

Introduction

This paper is set out to investigate the basic requirements for environmental noise measurement parameters to see what is required for the majority of cases. The idea is to try and identify a base set of measurements that will allow most environmental noise monitoring tasks to be carried out. In these austere times, this may well have an effect on the level of equipment needed by consultants or others, where simpler monitoring equipment could save time, energy and money.

Background study

Types of documents

The first part of the study was to determine the areas of investigation. Within the world of acoustics, there are many documents that detail measurement methods and parameters to be used. For this paper, it was decided to concentrate on standards, guidelines and regulations that specifically relate to the environment and how noise affects the public. The following areas have been listed as a guide to determining the documents to be considered. This will hopefully produce a comprehensive list of guidelines used by acoustics professionals in carrying out environmental noise surveys.

- British Standards
- Entertainment licensing and guidance
- Environmental acts of parliament
- EU Noise Directives relating to environmental noise
- Integrated Pollution Prevention & Control Guidance
- Noise & Statutory Nuisance Act
- Noise Insulation Regulations
- Town & Country Planning Acts
- World Health Organization (WHO) Guidelines

Data requirements

The data to be extracted from each of these documents is quite simply the parameters required for measurement that will allow the criteria of the document to be met in full. Additional information comes in the form of any post processing required on the data to produce information that need not be measured.

It is important to note a distinct difference in that some sound measuring equipment will produce data that is not actually measured but processed from other measurements. As this study is designed to look at the minimum requirements for sound measuring equipment, then it is assumed that any post processing can be carried out afterwards using PC software or a spreadsheet.

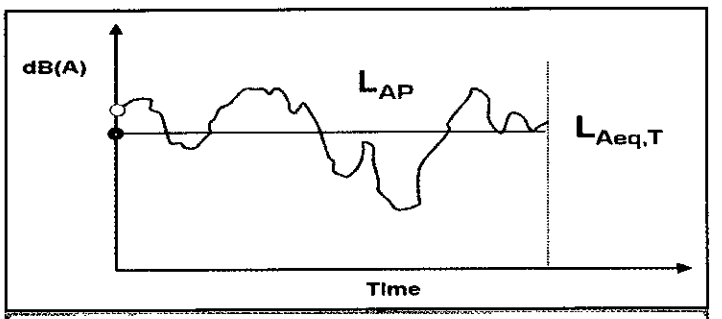


Figure 1

L_{Aeq} *Equivalent Level*

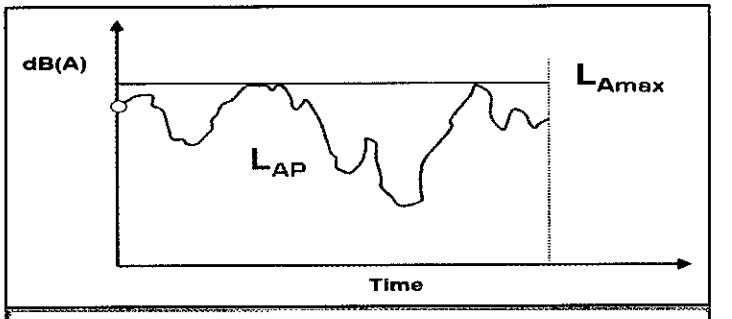


Figure 2

L_{Amax} *Maximum Level*

Methodology

Desk Study

The study for this paper simply involved a desk based analysis of as many standards as could be found relating to noise in the environment in the UK. From each of these standards, information was extracted looking at the measurement requirements in terms of what parameters are needed to produce the desired outcome for that document. These were then broken down into parameters that must be measured and those that can be calculated post-measurement.

Weighting Factor

Consideration was made as to whether a system of weighting should be used. This is because there is clearly a wider application of standards such as BS4142 that there is for the code of practice for water skiing and noise. This weighting factor would correct for this anomaly and allow the more regularly used standards to account for more of the result.

A simple system has been devised to account for this difference and ranks a document in the following way

1 Barely used document or standard for peripheral activity or minimal industry

2 Moderately well used document or standard relating to wider activity or industry

3 Heavily used document applied extensively in larger industries with widespread application

The weighting was simply applied to the occurrence of a required parameter to give a weighted representation of that parameter. This was then compared with the total available weighted score to give a percentage likelihood of that parameter being needed.

The process of measuring

State of the art in sound monitoring

Modern sound meters are capable of measuring multiple parameters

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What you can get away with... - *continued from page 29*

simultaneously, whilst sending the data directly to a website or even a mobile phone. Many of these systems use high powered processing to do this meaning a high level of power requirement and often huge amounts of data being produced. Here is a brief background to the process of producing such measurements in a sound meter.

There is a cut-off, even with modern technology, where a leap is required in the processing technology employed in the monitoring equipment for certain types of parameters. For example, it is relatively simply to produce L_{eq} and 2 or 3 percentile measurement, but to add frequency measurement or multiple statistical parameters require a whole different class of technology.

Sound pressure level (L_p)

Although this measure is not mentioned in the study below, it is very important as it is the figure we are all used to seeing on the screen of most sound meters. It is the actual display of the current 'sound level' and is a number taken from a complicated calculation used to produce an rms (root, mean, squared) signal from the rapidly fluctuating signal created at the microphone. This measure is 'damped' to differing degrees (SLOW or FAST) to slow it down and then a number from this is displayed every 1 second or so. The damping is very important when it comes to certain other parameters as it will affect the number produced.

L_{Aeq}

L_{Aeq} is a fundamental measurement parameter designed to represent a varying sound source over a given time as a single number. This number is a measure of the energy contained within the sound at the point of the receiver. This is useful in terms of the potential for sound to damage or disturb and is extensively used in environmental noise standards as well as many other regulations and documents.

Creating L_{Aeq} in a sound meter requires very fast processing such that transient (quick) signals are not missed. The actual sound signal from the microphone might be sampled fifty or sixty thousand times every second, and then the L_{Aeq} will be sampled from that at about one thousand times per second. A modern processing chip will be amply powerful for this job although many will still have to be run as fast as they can go to do it. The samples are then integrated (added together) and then averaged as they are produced. This means that all these calculations must be performed very quickly indeed!

L_{Amax}

The maximum rms is a simpler parameter to determine and is taken from the same calculation as that used to create the sound pressure level on the display (the rms). The L_{Amax} is simply the largest rms number produced by the processor (although this may not actually be displayed as the sound meter only displays the number every so often so your eyes can keep up!). This feed is basically the same as the L_{Aeq} although for the L_{Amax} it is very important that the correct damping is used as this will change the result!

L_{An}

Statistical measurements are completely different to the rms type parameters as they require (although they use the same feed as the L_{Amax}) a large number of samples to be stored and then counted by the processor. If you imagine a number of bins or boxes and each box is labelled with a decibel number from, say 30, to 50 and they go up in 0.1dB steps. Every time the sound meter samples a number that corresponds to a particular bin, it adds a marker to that bin. You end up with all the bins full of markers and then the processor can simply count the markers compared to how many there are in total, thus giving a percentage below which all the numbers occurred.

Analysis of the findings

There are a large number of documents dealing with the issues of noise in the environment, most of which relate to specific situations or are dedicated to an industry such as construction. It would also appear that there are situations for which there is no guidance or standard and in these cases, it is usual to work with a document that is either close to the situation, but not directly applicable or to use a more generic standard such as the World Health Organization Guidance.

The following Documents studied simply call up other documents or do not, in themselves prescribe measurement, for example in the case of

Parameters by order of importance

	Weighted		Un-weighted	
	Percentage	Cumulative	Percentage	Cumulative
L_{Aeq}	53%		53%	
L_{Amax}	24%	77%	21%	74%
L_{A90}	8%	85%	9%	82%
1/3 Octave	6%	91%	6%	88%
Octave	5%	95%	6%	94%
Other L_n	3%	98%	3%	97%
Other	2%	100%	3%	100%

Table 1

Results as weighted and un-weighted percentages, from which a number of conclusions can be drawn and some observations made. The parameters have been listed in order of importance and the cumulative column shows the additional effect of each type of measurement.

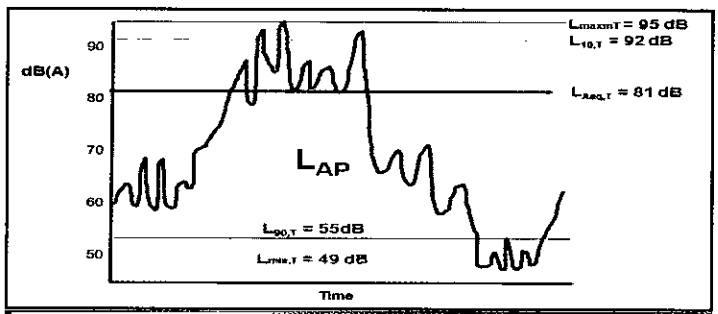


Figure 3

What the 'L' are you on about?

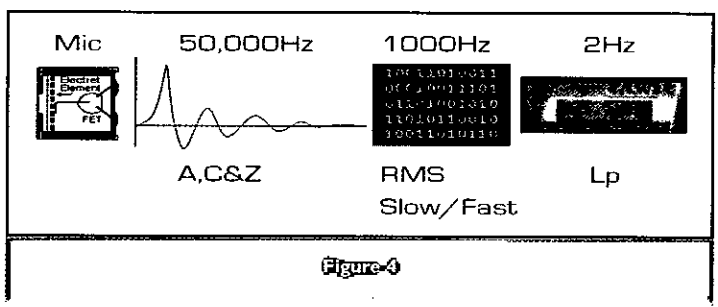


Figure 4

The basic stages in a modern sound meter required to measure sound pressure

ISO9613 – Additional types of attenuation, which is a predictive process using calculation methods:

- Environmental Protection Act, 1990
- ISO9613 – Additional types of attenuation
- Land Compensation Act, 1973
- Minerals Policy Statement 2: Planning, 2005
- Noise & Statutory Nuisance Act, 1993
- The Use of Conditions in Planning Permission, (1/85, 1985) 11/95, 2006
- Town & Country Planning – Assessment of Environmental Effects

The full set of data can be seen further on, but this can be summarized quite simply in Table 1.

The actual results listed above are in order of percentage importance, and it shows that 85% of tasks to the documents listed can be carried out with 3 basic parameter; L_{Aeq}, L_{Amax} and L90. Even un-weighted, this figure is as high as 82%.

The next highest measurement is 1/3 octave band, which certainly complicates the measurement process and doesn't account for a much increased scope, especially in the context that one of the standards using this only states that this kind of measurement 'may' be necessary.

The addition of L_{A10} to the 3 basic parameters increases the coverage to 88%

Conclusions

Even with the limited scope of this study and the necessity to include a somewhat arbitrary weighting system, it is possible to see that a very large percentage (up to 88%) of environmental noise measurement processes can be completed with 4 simple parameters; L_{Aeq}, L_{Amax}, L_{A90} and L_{A10}

Clearly this doesn't detract from the need for more complex monitoring where a standard calls for it and this will depend highly on the person responsible for the measurement. In the case of consultants, there will be a need to provide for many of these standards, in which case there is a necessity to have the ability to carry out these measurements. Where, however, an organization need only comply with a limited range of documents, it may only need relatively simple monitoring systems.

Measurement parameters

Definitions of parameters used in this study

$L_{Aeq,T}$ A-weighted equivalent continuous sound level over a stated time period

$L_{A90,T}$ A-weighted sound level exceeded for 90% of the measurement period (Background Noise)

$L_{A10,T}$ A-weighted sound level exceeded for 10% of the measurement period (Traffic Noise)

$L_{A01,T}$ A-weighted sound level exceeded for 1% of the measurement period (Maximum Noise Climate) similar to and normally measured as L_{Amax}

$L_{AMax,T}$ Maximum rms sound level

NNO Night Noise Offence parameter; the level not exceeded for a period of 0.6 seconds in a measurement of between 1 and 5 minutes.

SEL The L_{eq} with a reference period of 1 second for a given measurement duration.

Typical uses for parameters by application

Rail	SEL	Number and type of trains
	$L_{Amax,T}$	
Road	$L_{A10,T}$	Traffic counts, light & heavy vehicles
	$L_{Aeq,T}$	
Aircraft	SEL	Number & types
	$L_{Amax,T}$	
Industrial	$L_{Aeq,T}$	Occurrences of activities & periods
	$L_{A90,T}$	
	$L_{Amax,T}$	
	L_{APeak}	(Impulsive)
Construction	$L_{Aeq,T}$	Occurrences of activities & periods

References

1. BS 4142: 1997 Method of Rating Industrial Noise
2. BS 5228: 2009 Noise & Vibration Control on Construction
3. BS 8233: 1999 Code of Practice for Sound Insulation
4. Calculation of Railway Noise, 1995
5. Calculation of Road Traffic Noise, 1988
6. Code of Practice for Concert Noise - The Noise Council
7. Code of Practice for Water Skiing & Noise - UK Water Skiing Federation
8. Code of Practice on Noise from Clay Target Shooting, 2003
9. Control of Pollution Act 1974, Circular 2/76
10. Directive 2002/49/EC - The Assessment and Management of Environmental Noise (Lden)
11. Environmental Protection Act, 1990
12. Good Practice Guide on the Control of Noise from Pubs and Clubs
13. ISO9613 - Additional types of attenuation
14. Land Compensation Act, 1973
15. Minerals Policy Statement 2: Planning, 2005
16. Noise & Statutory Nuisance Act, 1993
17. Noise Mapping
18. Planning Guidance on Dog Kennels
19. Planning Policy Guidance PPG 24, 1994
20. Railway Noise and Insulation of Dwellings, 1991
21. The Noise Act 1996
22. The Use of Conditions in Planning Permission, (1/85, 1985) 11/95, 2006
23. Town & Country Planning – Assessment of Environmental Effects
24. World health Organization Guidelines on Noise

Data (see table below)

Specific Documents	Weighting	LAeq		LAmax		LA90		Other Ln		Octave		1/3 Octave		Other		Post Calc	Notes
		Required	weighted	Required	weighted	Required	weighted	Required	weighted	Required	weighted	Required	weighted	Required	weighted		
BS 4142. 1997 Method of Rating Industrial Noise	3	1	3			1	3										
BS 5228: 2009 Noise & Vibration Control on Construction	3	1	3	1	3												LA01, measured as Lamax
BS 8233: 1999 Code of Practice for Sound Insulation	1	1	1	1	1					1	1	1	1			SEL	
Calculation of Railway Noise, 1995	2	1	2														
Calculation of Road Traffic Noise, 1988	2	1	2					1	2								LA10
Code of Practice for Concert Noise – The Noise Council	1	1	1			1	1										
Code of Practice for Water Skiing & Noise – UK Water Skiing Federation	1	1	1	1	1											SEL	
Code of Practice on Noise from Clay Target Shooting, 2003	1	1	1													SNL	Shot Noise Level
Control of Pollution Act 1974, Circular 2/76	3	1	3														Normally LAeq
Directive 2002/49/EC - The Assessment and Management of Environmental Noise (Lden)	1	1	1													Lden	
Environmental Protection Act, 1990	3																No specified parameters
Good Practice Guide on the Control of Noise from Pubs and Clubs	2	1	2							1	2						May be required
ISO9613 – Additional types of attenuation	1																Predictive, not measurement
Land Compensation Act, 1973	1																
Minerals Policy Statement 2: Planning, 2005	3	1	3	1	3							1	3				Possible use of Octave
Noise & Statutory Nuisance Act, 1993	2																No specified measurement
Noise Mapping	2	1	2														
Planning Guidance on Dog Kennels	1	1	1			1	1										
Planning Policy Guidance PPG 24, 1994	3	1	3	1	3												
Railway Noise and Insulation of Dwellings, 1991	2	1	2	1	2												
The Noise Act 1996	1	1	1											1	1		NNO
The Use of Conditions in Planning Permission, (1/85, 1985) 11/95, 2006	1																Calls up other standards
Town & Country Planning – Assessment of Environmental Effects	1																Calls up other standards
World health Organization Guidelines on Noise	3	1	3	1	3												
Totals	66		35		16		5		2		3		4		1		
Weighted Percentages	100%		53%		24%		8%		3%		5%		6%		2%		
Unweighted Pergentages	34	18		7		3		1		2		2		1			
	100%	53%		21%		9%		3%		6%		6%		3%			

Table 1 (full)

Results as weighted and un-weighted percentages, from which a number of conclusions can be drawn and some observations made. The parameters have been listed in order of importance and the cumulative column shows the additional effect of each type of measurement.

ANC Conference 2011 – "the best yet"

More than 100 delegates attended the ANC Conference in Birmingham on 2 November when the main topics covered were environmental noise issues, along with sessions on school acoustics and a short legal update. In his opening remarks Rob Adnitt, ANC Chairman, observed that the conference aimed to address the demand from members for best practice exchange, information dissemination and peer discussion. He commented that the last year had seen a number of achievements for ANC, namely:

- Successful prosecution of fraud cases related to ADE
- Secure ADvANCE website established in England, Wales and now Scotland
- Increasing membership (to 116 companies)
- Successful half day workshop on wind farms
- Red Book and Guidelines on Noise Measurement in Buildings being updated.

Rob took the opportunity to announce that Rupert Thornely-Taylor had been awarded Honorary Membership and invited Sue Bird (ANC President) to present him with a certificate.

Environmental noise measurement and prediction

The opening session covered the 'Green Book' guidance on environmental noise measurement. A number of issues have been encountered while drafting this over which the working group not only disagrees, but were forced to accept that there may be a range of equally valid approaches. The conference provided an opportunity to obtain audience reaction to four motions on which an expert panel made up of Graham Parry (ACCON UK), Ed Clarke (Alan Saunders Associates), Jo Miller (Miller Goodall) and Patrick Shortt (Paragon Acoustics) provided opposing points of view. Speakers were against the clock having only three minutes to present their argument providing key points to support their opinion. Dan Saunders (Alan Saunders Associates) chaired the session and the four motions and their outcomes are summarised below.

Motion 1 – The default environmental noise survey duration should be one week

Delegate consensus: AGAINST

The importance of good quality and representative data capture is paramount. The survey period should be relevant and pertinent to the site in question and for the assessment for which the data will be used. The duration of the survey is of little consequence provided that the reason for its duration can be justified.

Motion 2 – All noise survey data must be stored as 1 minute samples (or shorter)!

Delegate consensus: AGAINST

The sample period has to be selected on the basis of the noise source being measured, use of the data and assessment being undertaken. Professional judgement needs to be employed as to the period length which would capture, in an adequate detail, the noise sources and features of the noise climate appropriately.

Motion 3 – You must use the highest measured L_{Amax} – averages are meaningless

Delegate consensus: AGAINST

Although the noise survey sampling process was accepted by most to be imperfect, we have to do something intelligent and appropriate with the data available. Again professional judgement is the key.

Motion 4 – BS4142 should not be used outside its scope

Delegate consensus: FOR

BS4142 should not be used beyond its scope. BS4142 can be helpful in providing a steer on assessment of sources outside its scope but care must be taken in the use of the ensuing "likelihood of complaints" which may or may not adequately quantify the noise impact of the source under investigation

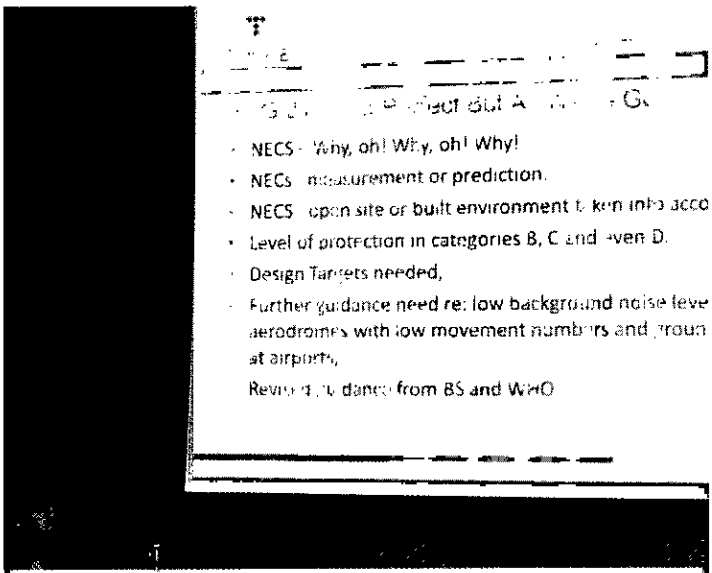
How the emerging planning guidance affects environmental noise assessment

The second session of the day was led by Dani Fiumicelli of Temple Group and the panel consisted of Belinda Gordon of Defra and Nick Tinsdeall of Birmingham City Council (speaking on his own behalf so his views are not necessarily those of the council).

Dani suggested that there was a need for both government policy and separate clear technical guidance to successfully address noise during the planning process. With only policy and no detailed technical guidance (as would potentially be the case should PPG24 be withdrawn) it would be very difficult to effectively and fairly assess noise in a consistent manner during the planning process using the limited information within the proposed National Planning Policy Framework (NPPF). Belinda Gordon from Defra then discussed the

Rob Adnitt welcomes delegates

Sue Bird presents Rupert Thornely-Taylor with Honorary Membership



PPG24 - not perfect but all we've got


Stephen Turner discussing entertainment noise

Noise Policy Statement for England (NPSE) and its aims. Nick Tinsdeall raised the concern that if current technical guidance was withdrawn (PPG24) there would not be enough time for local authorities to introduce planning noise guidance with any legal standing. This could potentially leave local authorities unable to control "noisy" development that could be described as "sustainable" based on the NPSE's presumption in favour of sustainable development.

The session generated significant discussion and many strong views were put forward. A recurring theme, identified by a number of attendees, was that the removal of detailed technical guidance would be likely to complicate the planning process with respect to noise and potentially frustrate achievement of wider planning objectives and that this would seem counter intuitive when the main aim of the NPPF was to simplify the planning process and stimulate development.

Entertainment noise including music festivals

The entertainment noise session looked at the ongoing revision of the 1994 Code of Practice on the Environmental Noise from Concerts. Stephen Turner, who was on the original Code working party, covered the background to the Noise Council Code and the drivers to the ongoing revision which is being undertaken by the Chartered Institute for Environmental Health. The review process has been supported by Defra who commissioned research to establish the attitudes of concert attendees and residents living near to venues.

Richard Mackenzie from the Building Performance Centre at Edinburgh Napier University presented the findings from the Defra research. Some of the key outcomes were:

- Men, households with children, people with hearing deficiencies, owner occupiers, people with double glazing and those who did not know the event was going to happen were all more likely to be annoyed by music in their homes.
- Urban events with ~100 dBA mixing desk levels tend to give ~ 10% "population annoyance" within 1km but under ~ 1 % complaints.
- Audience satisfaction drops as level approaches ~90 dBA.
- No need to treat urban stadiums differently from urban parks.
- Dose response suggests around 4% annoyance @ 40 dBA MNL rising to 33% at 70 dBA MNL for urban venues. The response rate still needs to be tested for rural events.
- Prior notification can significantly reduce annoyance levels.
- Majority of people support up to 5 events, 43 % support up to 12 events.

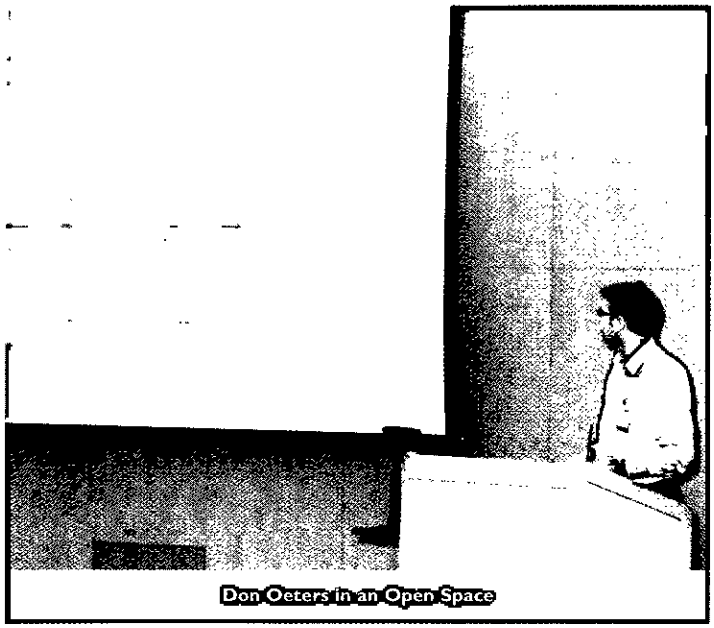
Following the presentation the expert panel made up of Stephen Turner, Richard Mackenzie and Rob Peirce from Vanguardia answered questions and led a discussion on the assessment and impact of noise from concerts. Opinions were expressed that the new guidance needs to provide more advice on the control and assessment of low frequency noise. There was general agreement that urban venues did not different criteria, but it was felt that more work was required on the impact in rural areas. The Defra concert noise research reports are available to download on the Defra web site, search for NANR292 & NANR 297

Developments in the acoustic design of schools

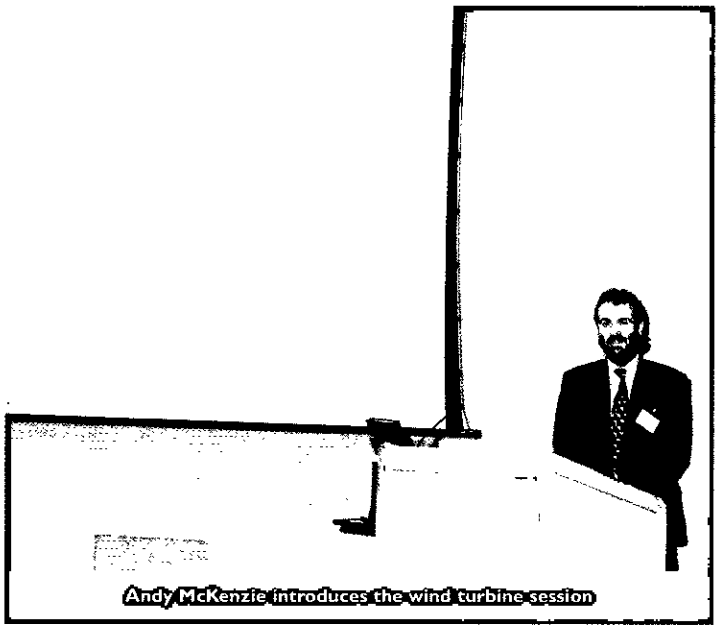
After a recent flurry of activity in the world of school acoustics, the conference session covered current hot topics and touched on some of the many issues surrounding the proposed amendments by Partnership for Schools (PfS) to schools regulations and guidance.

Andrew Parkin (Cundall Acoustics) began with an overview of what had been happening with a schools working group. This group had been convened by PfS and consisted of members of the original BB93 panel in addition to a couple of others heavily involved in school acoustics. The ANC schools committee is well represented on this group. After several meetings of the group, the 2009 draft revision for BB93 has been developed into a full-blown replacement document that has the potential to be used by PfS as a contract document for the imminent Priority Schools building programme (100 PFI schools).

continued on page 34



Don Oeters in an Open Space



Andy McKenzie introduces the wind turbine session

ANC Conference 2011 - *continued from page 33*

Jack Harvie-Clark (Apex Acoustics) gave a presentation on his views on the pitfalls on the proposed use of Dw as a sound reduction descriptor. The main issues surround the repeatability of measurements and issues surrounding testing into receiver rooms that are unfurnished (having little or no scattering).

Don Oeters (Arup Acoustics) then gave a presentation on the acoustics of sports halls. Many consultants have encountered problems when testing sports halls on completion, with reverberation times being significantly different to design targets. Don reviewed various test data and anecdotal evidence, concluding that the lack of low-level scattering and uneven distribution of absorption is the main reason behind the discrepancies. This research has fed into the revised schools guidance.

A short panel discussion followed, where the presentations and other topics surrounding schools acoustics were discussed. It was evident that schools acoustics remains a very popular subject with consultants and the revision of BB93 was broadly welcomed.

Wind turbine noise – current issues and hot topics

The wind farm noise session was introduced by Andy McKenzie with four speakers from across the spectrum. Colin Cobbing (ARM Acoustics) gave a presentation majoring on the planning aspects with a particular emphasis on EIA and the need to identify significant effects which include noise. In his review of the requirements he identified the need to take into account any uncertainties and also to identify where there was lack of knowledge or evidence to support the conclusions that were otherwise drawn. He felt some planning issues related to noise could be dealt with by better and more consideration of planning obligations etc. Dick Bowdler (New Acoustics) provided an enlightening assessment of the importance of cumulative impacts of multiple wind farm sites and explained the inherent difficulty with respect to cumulative noise conditions and how the "headroom" may have already been used up in a previously consented application.

Dani Fiumicelli (Temple Group) reviewed the issues related to wind farm noise complaints which came out of work that he had completed on behalf of Defra. He noted that one outcome of a wind farm was that the planning permission can over time change the character of an area, making it difficult to show that a statutory nuisance had occurred. Any investigation of noise complaints would need to be thorough with the use of noise measurements and subjective descriptions of the noise and its effects. Toby Lewis (Huntingdonshire District Council) dealt with the local authority noise issues, highlighting the fact that within the planning regime the authority's aim was to ensure that there was no significant loss of amenity. He said it was absolutely essential that wind farm promoters agreed in advance the methodology to be utilised for the assessment of noise effects for the ES. This would include the requirement to agree measurement locations and the relevant duration of noise measurements in order to obtain meaningful results which were less open to challenge. Recognising that ETSU-R-97 was the approved method for assessing wind farms, he highlighted the difficulties in assessing small and medium scale wind turbines where the approach to a noise assessment could use non ETSU methodologies.

A lively debate ensued from the floor with both Andy McKenzie (Hayes McKenzie Partnership) and Graham Parry (ACCON UK Limited) acting as chairmen and moderators of the session. Stephen Turner provided useful information about where the Government policy presently stood on wind farm noise with respect to ETSU. Tellingly, Andy McKenzie was of the view that there was a long overdue requirement for noise dose-response studies in the UK in respect of wind turbine noise.

Conclusion

Arrangements for the 2012 conference are already in hand with the challenge being how to follow this year's success in terms of content and format. ANC conferences are open to non-members and we are particularly pleased that two of the non member companies attending have now applied for membership. The feedback from those attending was very positive with nearly half the attendees completing the on line survey after the event. There were many useful suggestions of subjects for future conferences or workshops and the overall view was summed up by this comment: "This was the best ANC conference I have been to. It was well organised, informative, pitched at a very good level of interactivity, and had the correct formats for each subject. The mixture of technical and policy based items was well balanced. In short, it served as quite a timely reminder of why I entered into this industry in the first place!"

Thanks are due to all the speakers and panel members, to those who assisted on the day and in advance with organisational matters and to the session organisers who helped put the programme together. This article is made up of contributions from the latter group, namely: **Daniel Saunders, Matthew Hyden, Richard Mackenzie, Andrew Parkin and Graham Parry**.

Launch of online European noise map

European citizens will soon be able to access and upload data on noise levels in their area, thanks to a new application on the Eye on Earth online map service.

The European Environment Agency (EEA) has developed NoiseWatch to help the many millions of people across the EU exposed to damaging levels of noise.

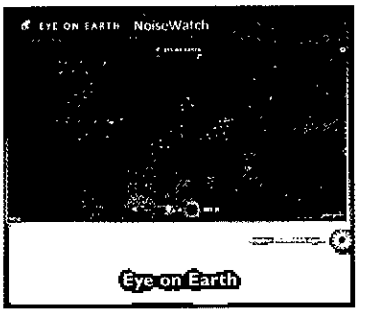
Noise levels can drastically affect quality of life. High levels of noise can cause heart disease, cognitive problems and tinnitus, while prolonged exposure to even low levels of noise can trigger hypertension and disrupt sleep. At least 100 million European citizens are exposed to damaging levels of noise from major roads alone.

NoiseWatch adds a new layer to Eye on Earth, which already includes WaterWatch, displaying information on bathing water quality, and AirWatch, which shows near-real time information on air quality. NoiseWatch will be based on data from 164 European cities.

An important aspect of Eye on Earth is that it combines official data with "crowd sourcing" – allowing the public to upload their own observations and information – and the NoiseWatch application is no different.

The EEA is also launching the NoiseMeter app for phones and other devices running Android, Apple iOS and Windows Phone 7.5 operating systems. This app allows anyone to rate noise levels in their area and upload them to the map.

Eye on Earth aims to improve understanding of the most pressing environmental challenges by bringing them to a local level, making them more relevant for citizens. Policy makers can also use the tool to understand and visualise environmental issues to support informed environmental policy making.



In another noise-reduction initiative, the EAA teamed up with the Noise Abatement Society (NAS) in the United Kingdom to present the European Soundscape Award for the first time to raise awareness and recognise initiatives that help reduce noise levels.

The winner was the Dutch province of Gelderland and the municipality of Wijchen for its sustainable and integrated traffic noise reduction solution in the village of Alverna. The project has combined a range of innovative measures to reduce noise levels. The measures consist of:

- Moving and reducing the number of traffic lanes
- Sinking the road by 0.5m
- Constructing low-level sound barriers of 1m on each side of the road
- Using special 'quiet' asphalt
- Reducing the speed limit from 80 to 50 km/h in Alverna.

IOA's 'deep regret' at EPUK closure threat

environmental protection uk

Former IOA President John Hinton has expressed his "deep regret" that Environmental Protection UK (EPUK) is set to cease to operate as a fully staffed and funded organisation.

The organisation, the UK's oldest environmental charity, has been badly hit by cuts to its income from local authorities and is due to close in March although efforts are under way to see if volunteers can carry on at least some of its work.

John Hinton said: "I was most concerned to hear about the imminent demise of EPUK.

"I was closely involved with its activities throughout my career with Birmingham City Council and I was privileged to chair its Environmental Noise Committee for many years.

"During my term as IOA President (2008-2010) I was able to foster closer co-operation between our Institute and EPUK which resulted in some joint initiatives and meetings and our sponsorship for some of the publicity material for EPUK's Noise Awareness Week activities.

"EPUK had many significant achievements, particularly in the field of the reduction of air pollution. In respect of noise I believe that its most significant achievements were to support local authorities in their efforts to mitigate noise pollution and to ensure that politicians and their advisors, particularly those at Westminster, took noise issues seriously.

"I hope that even at this late stage it will be possible for EPUK to at least continue with some of its important work, albeit through the use of volunteers."

Trevor Cox, current IOA President, added: "It is very disappointing that we are to lose an able ally in our important work helping the Government and trying to influence the regulations and policy for noise in the UK."

In 2010 the IOA honoured Mary Stevens, EPUK's policy chief and noise specialist, with its annual award for promoting acoustics to the public.

The organisation began life in 1898 as the Coal Smoke Abatement Society, later changing its name to the National Society for Clean Air before it was rebranded again in 2007 to become EPUK.

Outgoing Chief Executive James Grugeon said: "Local authorities have been forced in the past year to make very difficult funding decisions, following severe cuts to their budgets imposed by central Government.

"Within this economic environment, EPUK has faced an uphill battle to survive which, ultimately and despite our best efforts, we haven't been able to win."


John Hinton, IOA President 2008-2010, presents the Institute's award for promoting acoustics to the public to Mary Stevens of EPUK

Acoustic design of schools: a historical review

Bridget Shield

Introduction

For over one hundred years acousticians have been concerned about the effects of poor acoustics in educational establishments and have attempted to achieve an acoustic environment which enhances teaching, learning and listening conditions.

In the past 80 years a considerable amount of guidance on how to avoid typical noise and acoustics problems in an educational setting has been published in the UK, culminating in current discussions concerning the revision of Building Bulletin 93 (BB93)[1]. Published in 2003, BB93 sets out the acoustic requirements of the Building Regulations with regard to the acoustic design of new schools.

The early recommendations of the 1940s and 1950s were based upon the need to provide good speaking and listening conditions through control of background noise and reverberation. However, since the early 1970s there has been increasing evidence of the detrimental effects of noise and poor acoustic design on children's cognition and academic performance, annoyance and distraction, and on teachers' health[2].

This article provides an overview of the historical background to guidelines on school acoustics, and summarises some of the UK recommendations which have been published in the past 80 years. Current proposed changes and revisions to legislation on the acoustic design of schools are discussed.

Figure 1

Wallace C Sabine

Figure 2

Hope Bagenal

Historical background

Early writings on school acoustics

The scientific study and theoretical modelling of room acoustics developed directly from problems concerning acoustics in an educational setting. In 1895 Wallace Sabine, a 27-year-old assistant professor of physics at Harvard University, was asked by the Corporation of Harvard University to investigate acoustical difficulties in the lecture room of the Fogg Art Museum at the university. Sabine wrote[3]

"In the lecture room of Harvard University the rate of absorption was so small that a word spoken in an ordinary tone of voice was audible for five and a half seconds afterwards. Successive enunciations blended into a loud sound through which it was necessary to hear and distinguish the orderly progression of speech. Across the room this could not be done; even near the speaker it could only be done with an effort wearisome in the extreme if long maintained."

Sabine spent two years experimenting with absorption of various materials in the Fogg Lecture Theatre, developing the theory of reverberation and absorption, and ultimately correcting the problem by reducing the reverberation time from 5.61 to 0.75 seconds[3].

In the early years of the 20th century Hope Bagenal, who had trained as an architect, became interested in acoustics through his interest in auditorium design and love of music. In 1914 he communicated with Sabine after reading one of his articles, shortly before meeting Alexander Wood, a physicist at Cambridge University who was also interested in sound. Bagenal went on to become the first British acoustic consultant, advising on many important buildings. In 1931 Bagenal and Wood published the first British text book on the acoustic design of buildings[4]. The book discusses the planning of school buildings to prevent disturbance by noise, and advises on how to minimise reverberation in classrooms so as to avoid "much fatigue and irritation [to] teachers". The book also contains a section on the design of music schools.

In a later book, published in 1942[5], Bagenal gives further guidance on siting of school rooms, sound proofing between rooms and sound absorption to prevent "bathroom conditions". He is particularly critical of recently built technical colleges where "we who lecture to evening classes know the echoing corridors, the grim reverberant classrooms, the traffic noise without,...and as a result the extra effort on the part of lecturer and students to convey instruction and absorb it intelligently". He is also critical of modern school buildings 'which have been left empty, swept and garnished by the hygiene experts so that they are occupied by the Seven Echoes'.

Evidence of the problems caused by noise in schools was provided to the Summer Symposium of the Acoustics Group of the Physical Society (a forerunner of the Institute of Acoustics) in 1948 by John Lancelot Burn who was Medical Officer of Health for Salford[6]. Burn became aware of the problem of "unquiet" schools while attempting to carry out audiometric testing of children in quiet conditions in Salford schools. Many of his comments are relevant to today's schools:

Figure 3

Hope Bagenal - Planning for Good Acoustics 1931 - Recommends absorbent ceiling in classrooms (eel-grass quilt)

"It is well established that the normal development of infants and young children is seriously affected by constant loud noises... In addition to the disadvantages which noise may bring to the health and comfort of teachers and children ...teaching is still largely oral, and the teacher's voice must be clearly heard above the background noise... In some schools the problem has become worse – partly because of modern educational trends... Some recent schools are surprisingly noisy...modern architectural methods do not help in neutralizing sounds... Many modern materials have a reverberant effect... In such conditions teachers must often have a sense of hopelessness – and frequent attacks of laryngitis – endeavouring to make their voices heard."

Thus, during the 1930s and 1940s problems in schools of disturbance by noise, poor speech intelligibility and teachers' voice strain due to excessive noise and reverberation were recognised and written about. The 1940s also saw the first publication of recommendations for noise levels, reverberation times and sound insulation in schools.

Early recommendations on acoustic design of schools

After the war there was increasing interest in the UK in the problems of noise in buildings. This was reflected in the increasing amount of research on building acoustics carried out, for example at the Building Research Station, in the immediate post war period. Committees were established and meetings held to disseminate research results and ideas among the international acoustics community.

In its 1944 report the Committee on Sound Insulation and Acoustics of Buildings[7] suggested that intruding noises for classrooms should be 25 or 30 phons; this is based upon a suggested standard of 15 to 20 phons for

Figure 4

Building Bulletin 1 - New Primary Schools - October 1949

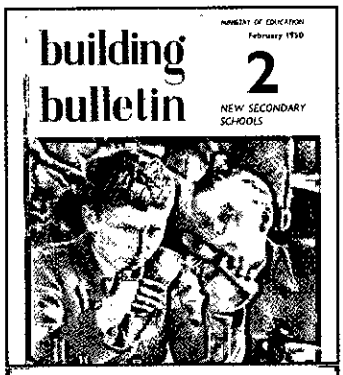


Figure 5

Building Bulletin 2 - New Secondary Schools - Feb 1950

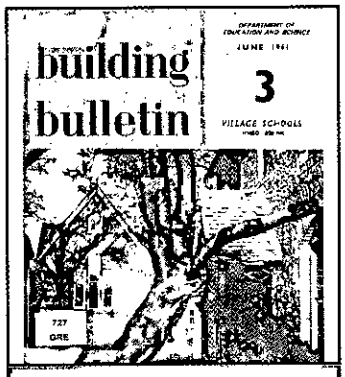


Figure 6

Building Bulletin 3 - Village Schools - June 1961

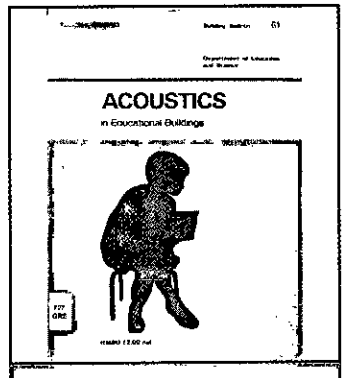


Figure 7

Building Bulletin 51 - Acoustics in Educational Buildings 1975

study, reading and writing and allowing for "the enhanced background noise due to the numbers of children normally in a classroom". The report discusses the siting and planning of schools, and airborne and impact sound insulation requirements.

The following recommendations are given:

- The site should be selected to be as quiet as possible; a minimum distance of 100 feet between classrooms and the nearest road is recommended.
- Within schools the classroom block should be separated from noisier rooms.
- Minimum standard for airborne sound insulation between classrooms and corridors and between classrooms: 45 dB.
- Minimum standard for impact sound insulation between any classroom and a classroom beneath: improvement of 15 phons on a bare concrete floor

continued on page 38

Acoustic design of schools - *continued from page 37*

and of 20 phons on a bare timber floor.

- Maximum reverberation time in an occupied classroom: 1 second at 500 Hz.

In their textbook published in 1950, Knudsen and Harris[8] recommended 35 to 40 dBA as the acceptable level for unoccupied classrooms and lecture rooms. They explain the importance of choosing quiet sites for schools and devote a long chapter to the design of school buildings, stating that "Acoustics in one of the most important physical properties that determine how well a school's building can serve its primary function. Thus the exclusion of noise and the reduction of reverberation are indispensable in adapting classrooms to the function of oral instruction". Knudsen and Harris also discuss the siting and layout of school buildings, plus the acoustical design of classrooms and other spaces (including lecture rooms, music rooms, gymnasia and libraries) with particular reference to the amount of acoustic absorption required in each room.

It is interesting to note that the current specifications for noise levels in new school buildings given in BB93 are very similar to those that have been recommended for the past 70 years, although requirements for reverberation times have reduced over the years as we have become more aware of the appropriate design of rooms for speech, and of the speech intelligibility requirements of children.

Government guidelines on school acoustics: *Building Bulletins and Design Notes*

In October 1949 the Ministry of Education published the first of a series of *Building Bulletins* which were designed to meet the "need for guidance on educational building matters which is less formal than regulations, circulars or administrative memoranda, and which will reach a wider audience than official letters" [9]. *Building Bulletin 1*[9] was concerned with the building of new primary schools and *Building Bulletin 2*[10], published in February 1950, with new secondary schools. There is no detailed discussion of acoustic design in these two publications. However, *Building Bulletin 1* refers to the need to provide quiet spaces where children may rest and to the conflicting acoustic requirements of school halls. Reduction of noise in dining halls and corridors through the installation of sound absorbent ceilings and floor finishes is recommended. *Building Bulletin 2* contains a short section on noise which briefly discusses careful planning of the layout, together with sound insulation and absorption; the use of quiet resilient floor coverings, and rubber stops on the feet of movable furniture are again recommended.

Building Bulletin 3[11], which was published in 1961, dealt with the specific problems of small (typically two or three classrooms) village schools, and the remodelling of existing village schools. Noise control was briefly discussed and the use of partitions and sound absorbent ceilings recommended if two teachers had to share a room.

Building Bulletin 51 (1975)

A building bulletin designed to address specifically the area of acoustic design of educational buildings, *Building Bulletin 51* (BB51), was published by the Department of Education and Science in 1975[12]. BB51 contained sections on the fundamentals of sound, noise control, and listening conditions in different types of school spaces: 'small rooms', 'large rooms' and "large teaching areas" (that is, open plan classrooms), and its principles and calculations were illustrated by several examples. Recommendations were given for background noise levels and reverberation times. Background noise level, BNL, was defined by a series of curves which were modifications of NC curves, while a chart of preferred reverberation times for music or speech in different room volumes, being the optimum RT at 500 Hz, was given.

It is interesting to note that a significant part of the document concerns open plan areas, reflecting the school design trends of the 1970s[13], with considerable discussion of screens, enclosures and double partitions, and three of the eight case studies referring to open plan spaces.

Requirements and recommendations for noise control to optimise speech intelligibility and speech privacy and to prevent speech interference are given. These are combined to give maximum BNL for various school areas and teaching group sizes; some examples are shown in Table 1.

Design Note 17 (1979 and 1981)

BB51 was followed (but not superseded) in 1979 by *Design Note 17*[14] which combined guidance on the environmental design of school buildings, including acoustics, and energy conservation. The noise level and reverberation time requirements were the same as those in BB51, to which the reader was referred. A second edition of *Design Note 17* was published in 1981[15]; however the acoustics section was the same as in the 1979 version.

Type of space	BNL
Music and drama rooms	25
Teaching groups > 35 people Theatres, large lecture rooms	30
Teaching groups 15 to 35 people Theatres, large lecture rooms	35
Teaching groups < 15 people	40
Libraries, study area	45

Table 1

Building Bulletin 51 : Maximum background noise levels

Type of space	BNL
Audiometry rooms	20
Small groups (1-4)	25-30
Normal size groups (8-10)	30
Music rooms	25
Workshops, craft areas, PE spaces	35

Table 2

Design Note 25: Background noise levels for hearing impaired pupils

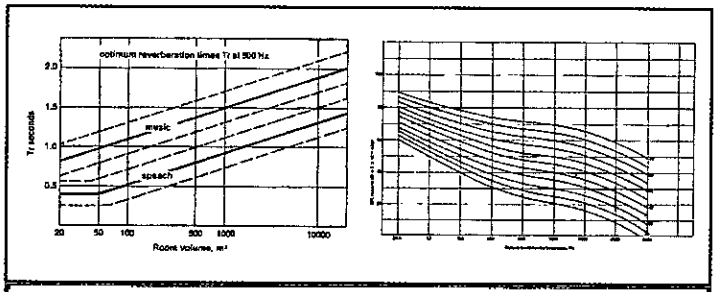


Figure 1

Building Bulletin 51

Background noise level *Reverberation time (at 500 Hz)*

Design Note 25 (1981)

Design Note 25, also published in 1981, addressed the lighting and acoustic needs of visually and hearing impaired pupils[16]. It points out the needs of both groups for good acoustics and good lighting. Hearing impaired pupils need good lighting to enable them to lip read, while those with visually impairments rely on aural clues, mainly from reflected sound, to navigate a space; both groups obviously require good speech intelligibility. For hearing impaired pupils the recommended RT for teaching spaces is 0.5 s – 0.75 s in the audible spectrum; the background noise level should be 10 dB below BB51 values; and the background noise spectrum should approximate the curves in BB51, especially at frequencies below 500 Hz. Advice on individual and group hearing aids is also given. Table 2 gives the recommended background noise levels for specific types of space.

With regard to open plan spaces the following statement is made: "...unmitigated open planning will not provide satisfactory acoustic conditions, as indeed it frequently fails to do in ordinary schools".

Building Bulletin 86 (1997)

Building Bulletin 86[17] concerns all aspects of the design of music accommodation in secondary schools, including detailed guidance on the acoustic design. The planning of a music suite to reduce sound transmission both within and from music rooms is discussed, together with construction details of doors and windows. Requirements in terms of room volume and geometry,

Type of space	BNL
Music and drama rooms	30
Teaching rooms and classbases	40
Lecture rooms	35
Indoor sports rooms	50
Libraries	40

Table 3

Building Bulletin 87: Maximum background noise levels

Type of space		RT (s)
Primary schools	Classroom	0.5 – 0.8
	Library	0.5 – 0.8
	Hall	0.8 – 1.2
	Dining room	0.5 – 0.8
Secondary schools	Classroom	0.5 – 0.8
	Library	0.5 – 1.0
	Hall	1.0 – 1.4
	Dining room	0.5 – 0.8
	Gymnasia	1.0 – 1.5

Table 4

Building Bulletin 87: Maximum background noise levels

background noise levels and reverberation times to achieve the desired sound quality are given.

Building Bulletin 87 (1997)

Design Note 17 was revised and published as *Building Bulletin 87* in 1997[18]. BB87 covered acoustics, lighting, heating, ventilation, water supplies and energy ratings. The acoustics section provided guidance on planning and noise control in school buildings, and gave recommended constructional standards for background noise levels, reverberation times and sound insulation. Brief guidance was given on particular topics such as open plan areas, art and music rooms, and design for pupils with hearing and visual impairments. Optimum RTs were specified by a chart, similar to that in BB51, and also tabulated for various types of space in primary and secondary schools, as the mean of RTs at 500 Hz and 1000 Hz. Sound insulation was specified as D_w required for various combinations of activity noise and noise tolerance in adjacent spaces. Maximum background noise levels, specified as $L_{Aeq,1hr}$, arising from noise unassociated with teaching activities such as traffic and ventilation noise, and noise from adjacent areas in the school, were specified.

Tables 3 and 4 give some examples of BNL and RT for various school areas.

This appears to be the first time that criteria for primary and secondary schools have differed and recognises the more stringent RT requirements of younger children.

For hearing impaired pupils it is recommended that, as in *Design Note 17*[15], background noise levels should be 10 dBA lower than those for mainstream pupils; and that the reverberation time for teaching rooms should be between 0.3 and 0.6 s.

Building Bulletin 93 (2003)

The acoustic design of both new and existing school buildings in England and Wales is covered by the Education (School Premises) Regulations 1999[19] which require each space in a school to have "the acoustic conditions and the insulation against disturbance by noise appropriate to its normal use". A similar statement was included in Requirement E4 of the Building Regulations 2000. However, despite these regulations and the many guidelines on acoustic design of schools, plus the increasing body of research evidence on the detrimental effects of noise and poor acoustics on children and teachers[20], many schools

continued on page 40

Acoustic design of schools - *continued from page 39*

continued to have inadequate acoustic conditions for teaching and learning. Therefore in 2003 Part E of the Building Regulations was amended so that new school buildings had to meet specific performance standards for reverberation times, noise levels and sound insulation. Those performance standards were specified in *Building Bulletin 93: Acoustic Design of Schools*' (BB93).

BB93 was published in 2003 by the Department for Education and Skills (DfES) and replaced the Acoustics section of BB87. Maximum indoor ambient noise levels (IANL) and mid-frequency reverberation times T_{mf} (average of RT at 500 Hz, 1000 Hz and 2000 Hz) are specified for a range of spaces within schools. The IANL is the highest $L_{Aeq,30min}$ likely to occur during normal teaching hours in unoccupied and unfurnished spaces, due to external sources and building services. Airborne and structural sound insulation between spaces are also specified, together with a speech intelligibility requirement (STI > 0.6) for open plan classrooms. Some examples of IANL and T_{mf} requirements are given in Table 5.

There is a great deal of anecdotal evidence from noise consultants to show that BB93 has been effective in improving the acoustic design of schools. Objective data from a current project on the acoustics of secondary schools suggest that both noise levels and RTs have decreased in school buildings since its introduction[21].

Revision of BB93 and Schools Premises Regulations

Labour Government proposals 2008 – 2010

When BB93 was introduced in 2003 it was agreed that it was likely to need reviewing after around 5 years; and the two government departments responsible, the Department for Children, Schools and Families (DCSF, formerly DfES) and the Department of Communities and Local Government (DCLG) agreed in November 2008 to a minor review[17]. The aim of the review was to bring BB93 up to date; to clarify points where there were uncertainties or ambiguities; to reference other more recently published relevant guidelines such as those referring to sustainability and disabled access and inclusion; and to review the original performance standards. Following wide consultation it was agreed that the values of the latter should only be altered where there was good research evidence for a change. However there were concerns that the needs of pupils with hearing and other communication difficulties were not being met under the current regulations; that more guidance regarding open plan classrooms was required; and that there were conflicts between noise level and ventilation requirements[22].

A draft revision was circulated in the spring of 2009 which addressed these points while maintaining most of the original performance specifications. However, nothing further was heard from DCSF or DCLG concerning the publication of the revised document.

In the meantime the National Deaf Children's Society (NDCS) had been lobbying the government to introduce mandatory acoustic testing of new

Type of room	IANL $L_{Aeq,30min}$ (dB)	T_{mf} (s)
Primary school classroom	35	< 0.6
Secondary school classroom	35	< 0.8
Open plan teaching area	40	< 0.8
Music classroom	35	< 1.0
Small lecture room	35	< 0.8
Large lecture room	30	< 1.0
Classrooms for hearing impaired students	30	< 0.4
Science lab	40	< 0.8
Assembly/multi purpose hall	35	0.8 – 1.2
Drama studio	30	< 1.0

Table 5

Some BB93 performance specifications (spaces unoccupied and unfurnished)

Figure 9

Building Bulletin 51 - Open plan schools

schools to ensure that they complied with the Building Regulations. In October 2009, in a written Parliamentary statement, the Minister of State for Schools and Learners, Vernon Coaker, endorsed the need for good acoustics in school buildings; promised an update of BB93 for consultation in 2010; and announced that he had instructed DCSF officials to work with CLG to study the implications of mandatory testing with a view to a issuing a formal consultation in 2010.

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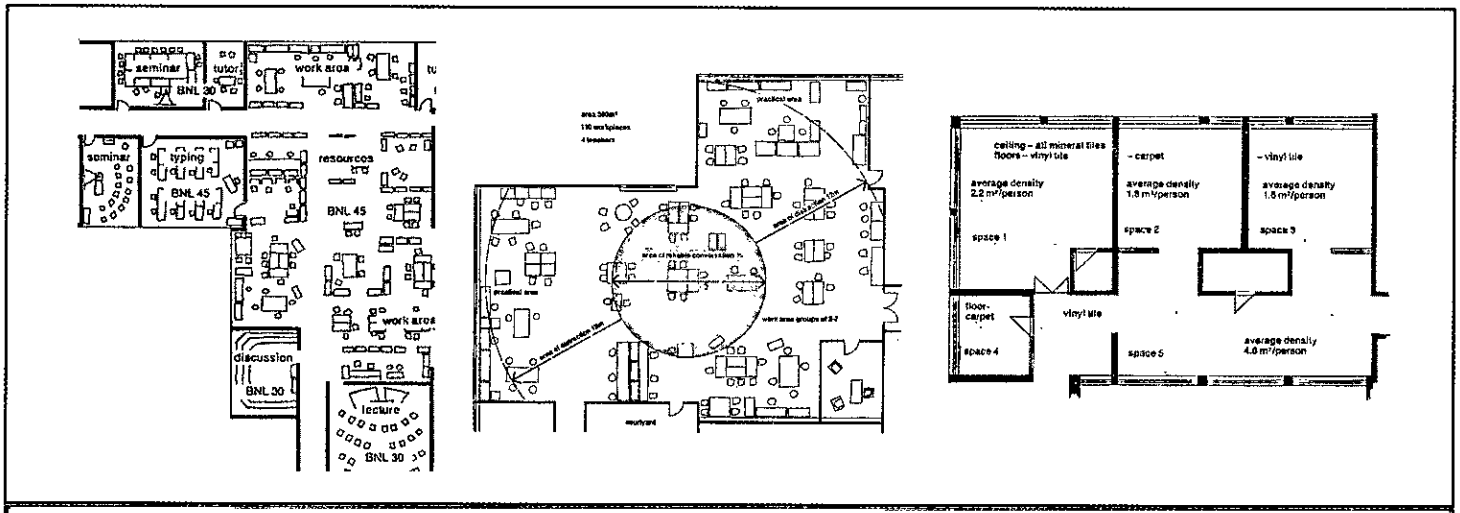

Figure 10

Building Bulletin 51 - Open plan schools

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Acoustic design of schools - *continued from page 40*

However, in May 2010, before any consultations were issued or a revision of BB93 published, there was a General Election which resulted in a change of government. This has had significant implications for the revision of the regulations and guidance on the acoustic design of school buildings.

Coalition Government proposals 2010 -2012

In the early days of the new government two announcements concerning the building of schools were made. The Building Schools for the Future (BSF) project was discontinued; this had been introduced under the previous government and led to the building of many new schools during the first decade of the 21st century. The Government also announced the setting up of "free schools", that is independent state-funded schools which may be established by any interested group and may be housed in any available and suitable building (not necessarily previously used as a school building). Both of these changes mean that refurbishment rather than new build is going to be of primary concern for school buildings for the foreseeable future, and hence any new or revised guidelines on school acoustics need to address the issue of refurbishments.

Under the new government the regulations on the acoustic design of school buildings, namely Requirement E4 of the Building Regulations and BB93, have come under threat on two fronts. In July 2010 the DCLG launched a review of the Building Regulations with a view to reducing "the burden of technical and administrative aspects of regulation". In announcing the publication of the report in December 2010[23] Andrew Stunell, Under-Secretary of State for Communities and Local Government, stated that "there are a number of key areas where we want to explore the potential for deregulation and streamlining of the existing provisions". In the report the DCLG said that they were working with the Department for Education (formerly DCSF) to determine whether Requirement E4 plus guidance "is the most appropriate and effective way of achieving appropriate [acoustic] standards for school buildings".

Simultaneously, the Department for Education carried out a comprehensive review of capital investment in education (the "James review"). The report was published in April 2011[24] and was critical of the "burden of regulation and guidance" including the large number of regulations, *Building Bulletins* and other bureaucracy involved in the building of a new school. The review recommended revision of school premises regulation and guidance to "remove unnecessary burdens".

The acoustics community became very concerned that, following these reviews, Requirement E4 and BB93 would be withdrawn, and that there would no longer be any legal requirements governing the acoustic design of schools.

A symposium was arranged jointly by the Institute of Acoustics (IOA) and Association of Noise Consultants (ANC) in December 2010 to debate the issue of school acoustics and raise awareness of the importance of good acoustic design for both students and teachers, and of the threat to the regulations. At the same time the IOA launched its "Sound Schools" campaign, led by Peter Rogers, calling on the government to retain standards for classroom acoustics. Letters were written to MPs and government ministers and meetings were held with, among others, the chair of the Commons Select Committee on Communities and Local Government; representatives of the Department for Education and Partnerships for Schools; members of the House of Lords; and the Under Secretary of State for Education. A briefing note was prepared highlighting the costs of poor acoustic design, for example the costs of remedial treatments and of compensation paid to teachers with voice problems.

The IOA and ANC agreed that, even if Requirement E4 and BB93 were withdrawn, a revision of BB93 should be published to provide guidance on good acoustic design of schools. The BB93 review panel has therefore been working closely with Partnerships for Schools to produce a revised document, with all the performance specification values being examined and debated at length. Although *Building Bulletins* have now been abolished, it has been agreed that the new document would cover essentially the same material as the original version of BB93, albeit it updated and expanded. The name of the new document is to be *Acoustic Design of Schools*. It is hoped that a draft document will be circulated for consultation early in 2012, with a view to publication in the autumn.

In addition to the performance specifications for new schools criteria will be given for conversions and refurbishments. There will also be new sections on

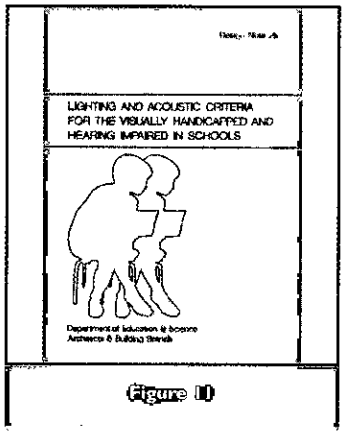

Figure 10

Design Note 25 - 1981 - Lighting and acoustic criteria for the visually handicapped and hearing impaired in schools

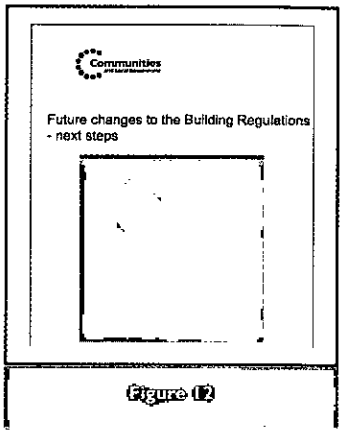

Figure 12

CLG report December 2010

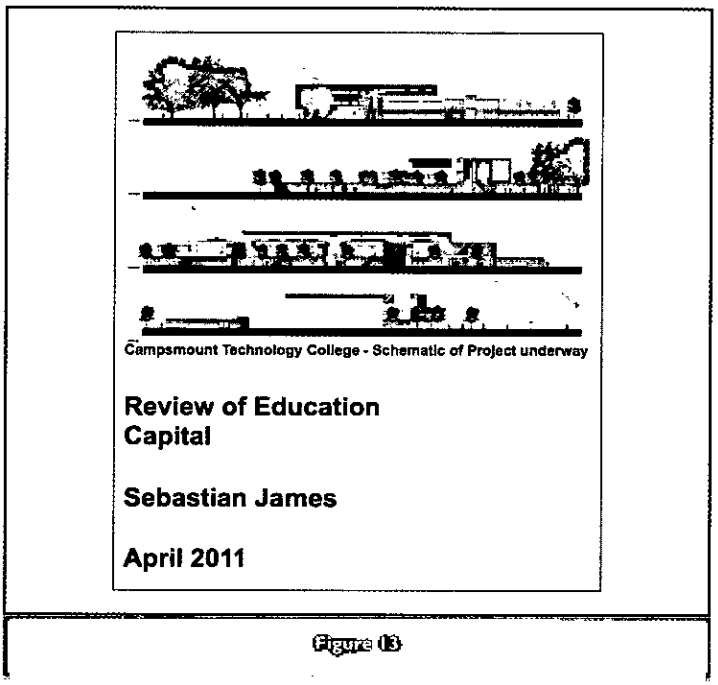

Figure 13

DfE 'James' review April 2011

ventilation, and on absorption in sports halls. The section on open plan classrooms will be greatly extended, reflecting the findings of recent research in this area[25]. In addition to minimum STI requirements for speech intelligibility within teaching groups there are likely to be maximum requirements for speech privacy between groups. There will be a new section on designing for an inclusive environment to address more comprehensively the requirements of children with special educational needs and disabilities, and to comply with current disability discrimination legislation. The section on acoustic design and equipment for pupils with special hearing requirements will also be greatly expanded.

Concurrently with the revision of the acoustic design guidance and specifications, the DfE have been working to implement the recommendations of the James review by greatly reducing and simplifying the Schools Premises Regulations (SPR). In future all schools will be covered by one set of SPR, rather than having separate standards for independent schools as at present; thus the revised SPRs will apply to academies and free schools. The principles of the SPR revision are currently (December 2011) out for consultation[26]. It is very encouraging to see that, although it is proposed to remove 16 regulations, acoustics is included in the seven regulations to be retained. Furthermore the consultation document makes reference to the new document *Acoustic Design of Schools*, to be published in 2012, and explains that IANL, RT and sound insulation will continue to be controlled by Requirement E4 of the Building Regulations. It also recommends that testing is carried out to ensure

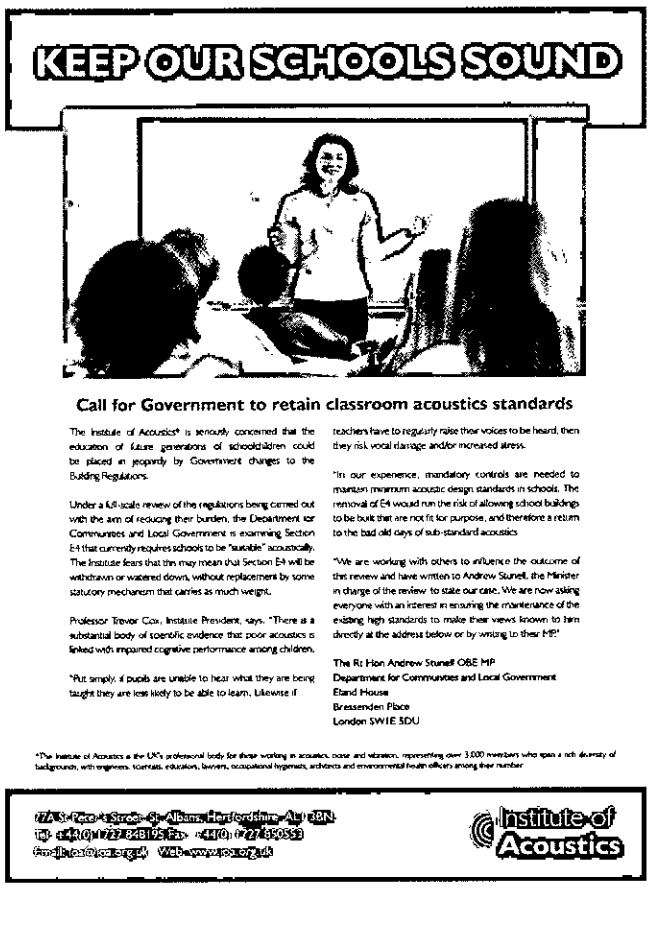

Figure 14

IOA 'Sound Schools' campaign

Figure 15

Has BB93 had an impact?

compliance. The implication is that speech intelligibility in open plan classrooms will be governed by the SPR.

Conclusions

The impact of acoustic design on speaking, listening and understanding in teaching environments have been understood and written about since Sabine's early work in the 1890s. Furthermore, specific recommendations for noise levels, sound insulation and reverberation times in school have been made for the past 70 years. Yet, until recently, schools continued to be built with an acoustics environment that was not suitable for teaching and learning. Since 2003 the acoustic design of new schools has improved due to the inclusion of school buildings in the Building Regulations. Despite concerns that, in the current government's desire to reduce the amount of regulation governing school buildings, acoustics regulations would be abolished it is proposed by the Department for Education that the acoustic regulation will be retained in revised School Premises Regulations. Moreover, although no official announcement has yet been made by DCLG, at the time of writing it appears that Requirement E4 of the Building Regulations will also be retained and will continue to control the levels of IANL, RT and sound insulation in schools.

Acknowledgements

The author would like to thank Peter Rogers and others involved in the IOA "Sound Schools" campaign, the ANC Schools Committee chaired by Andrew Parkin, and the BB93 review panel for their commitment in campaigning to retain the acoustics regulations for schools; and for their continuing efforts to produce improved regulations and guidance.

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continued on page 44

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This article is a revised version of the first part of the RWB Stephens Medal lecture that Bridget presented at Acoustics 2011 in Glasgow in September 2011.

Corrections

Investigation of the 'Den Brook' Amplitude Modulation methodology for wind turbine noise

The above article in the November/December 2011 issue of Acoustics Bulletin contains some factual errors. Whilst these errors do not affect the conclusions of the article in any way, corrections are presented here in the interests of transparency.

To verify the findings of the article, the measured, raw data from both locations had been provided to two independent acousticians for review. During this review it became apparent that the analysis in the article had not been carried out on A-weighted Leq values, as was stated.

Upon checking the Matlab methodology used to process the raw audio data, it became apparent that the A-weighting filter was not working as expected. To rectify this, the methodology was revised and the software 'dBFA' utilised to generate the required LAeq, 125msec data directly from the audio recordings. This re-processed data were checked against the measured 1-second, Lp data and found to accurately replicate these levels. This confirmed there is nothing fundamentally wrong with the measured audio data and that the error was purely due to a processing fault.

The study detailed in the report has been repeated using this newly reprocessed LAeq, 125msec data. This has altered the values presented in Figures 3, 6, 7, 8, 10 and 11. In summary, the headline figures of the report show that the total percentage of the 1 hour periods failing the test at Turncole changes from 92 % to 83 % and that the total percentage of 1 hour periods failing the test at Rotsea changes from 88 % to 67 %. As such it can be seen that this processing error does not alter the key findings of the report and its conclusions still stand.

A corrected copy of the article is published at: http://www.res-group.com/resources/download-area.aspx

Finally, the author would like to apologise for any inconvenience caused as a result of these errors.

Wind farm noise dose response

The editor has been contacted by Dani Fiumicelli, technical director at Temple group Ltd, who was credited as the sole author of the article reviewing wind farm noise dose response in the November/December 2011 issue of Acoustics Bulletin. Dani wishes to make it plain the article is largely based on research and previously unpublished work, which Dani updated and expanded upon, by Colin Cobbing and Marcus Richardson, who are both directors in the firm of ARM Acoustics, and David Horrocks and John Pointing of Statutory Nuisance Solutions who are associates of ARM Acoustics.

IAC hemi-anechoic chamber is a world beater

Giant US test facility 'sets new standards'

IAC has officially handed over a turnkey acoustic test facility to Cummins Power Generation, a subsidiary of Cummins Inc., at its headquarters in Fridley, Minnesota, USA. The facility, which is the largest of its kind in the world, comprises of a hemi-anechoic chamber, control room and preparation area.

The new facility was built to carry out precise acoustic measurements around generator sets of all sizes. Being able to take consistent measurements has enabled Cummins to pinpoint sources of noise around a generator set and ultimately develop quieter engines in the future. Prior to the new 23,000-square-foot building, acoustic testing had been carried out outdoors, which made repeatable testing an issue and also caused unwanted noise to neighbouring communities. The new hemi-anechoic chamber not only makes the testing space acoustically accurate, but also acts to contain noise within the building. This means that testing can be carried out for longer periods, increasing productivity.

As turnkey providers, IAC handled all aspects of the design and build. Vince Byrne, lead project manager on the project, said: "IAC handled all mechanical, electric, acoustic and civil aspects of the job. This project utilised all of our extensive acoustic design manufacturing expertise right across a whole range of product areas, including acoustic louvres, Conic-Flow® silencers, Noishield® acoustic panels, AHUs, Metadyne® wedges and Noise-Lock® acoustic doors."

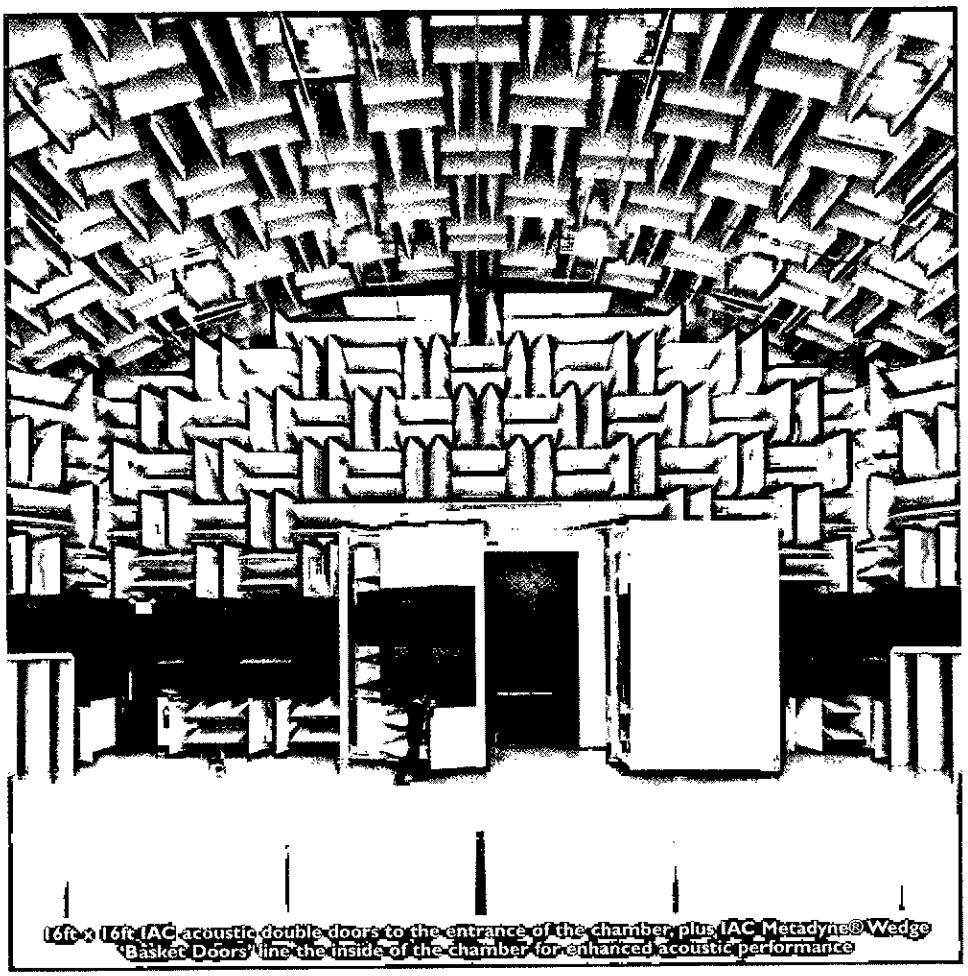
With the capability of testing large generator sets that produce up to 3.3 MW of electricity, and with the ability to expand to handle generator sets up to 4.4 MW in the future, IAC worked very closely with Cummins on designing the air handling and mechanical installation. The system, which incorporates IAC acoustic air handling units, plenums and

duct silencers, allows up to 105m³ per second or air to travel into and out of the main chamber. Moving such a volume of silenced air proved a real challenge, but now installed, the whole system can be managed by a single operative via an IAC designed control system.

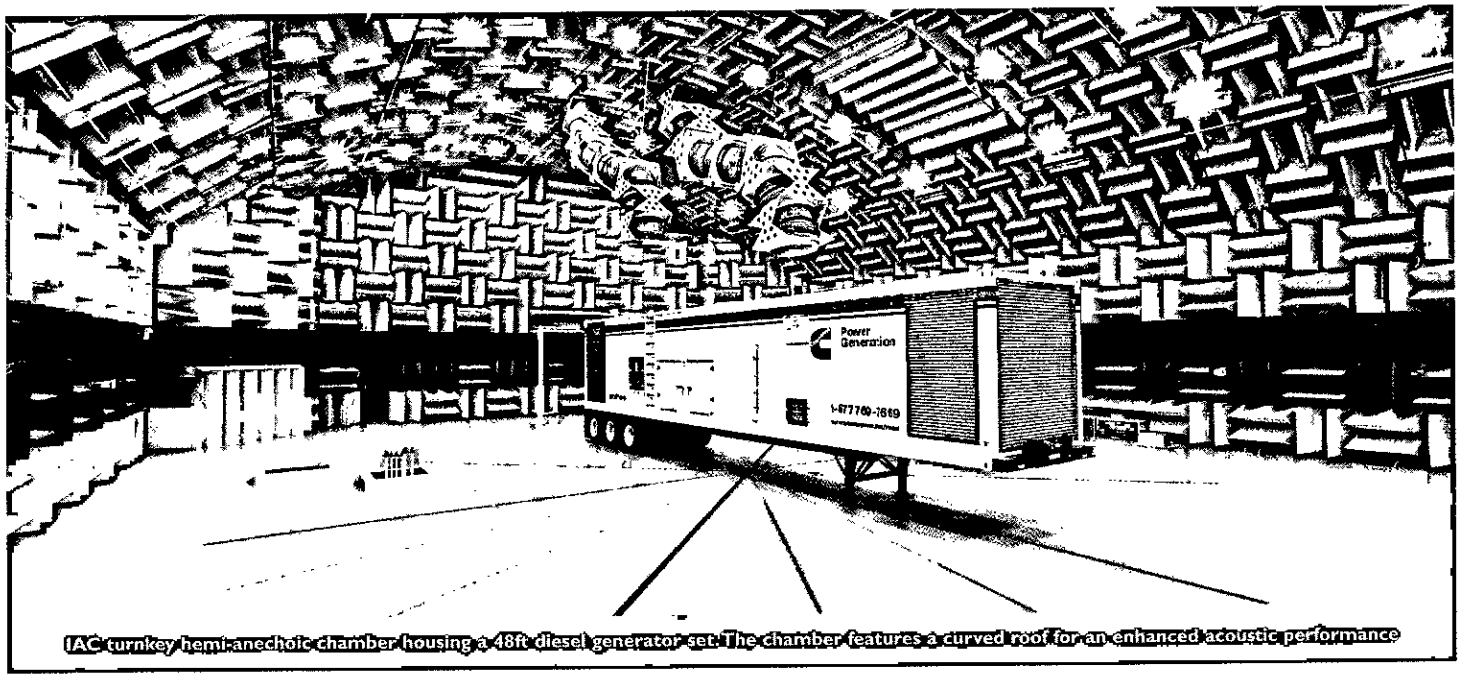
The hemi-anechoic chamber is ISO 3745:2003 and ISO 3744:2010 compliant with a cut-off frequency of 50Hz. The chamber was initially specified to have a background noise rating of NC20 for both general ventilation and 'Mode 1' for the quietest generator set on test. Since the facility was handed over, an independent report has been carried out stating that the chamber in fact performs at around NC15 at the two different modes, equating to the kind of suitable background noise levels for a broadcast or recording studio. Even at the highest ventilation volume setting for very large generator sets, the background noise level is still an average of NC33, lower than the NC35 target in the specification.

Graham Dale, general manager of IAC's Industrial Division, concluded, saying, "The facility for Cummins is the most prestigious ever won by IAC and highlights our capability as a turnkey supplier to not only manage a large scale construction project, but also exceed the acoustic performance set out by the client."

For more details, contact IAC at **01962 873000** or go to **www.industrialacoustics.com** Email: **info@iacl.co.uk**



16ft x 16ft IAC acoustic double doors to the entrance of the chamber plus IAC Metadyne® Wedge 'Basket Doors' line the inside of the chamber for enhanced acoustic performance



IAC turnkey hemi-anechoic chamber housing a 48ft diesel generator set. The chamber features a curved roof for an enhanced acoustic performance

Ramboll Acoustics stages international conference

Delegates from six countries share knowledge at Cambridge event

With 50 acousticians in six countries, Ramboll is one of the largest acoustic engineering consultancies. The 2nd International Ramboll Acoustics conference held in Cambridge on 10-12 November, attracted more than 30 delegates and offered a prime opportunity to share knowledge and innovation throughout the practice.

The topics for discussion were wide ranging, covering such diverse subjects as Finite Element modelling of structureborne vibration, 3D auralisation systems, underwater acoustics, helicopter detection techniques, wind farms, indoor climate and sustainability, as well as the noise generated by Zumba dance classes.

Of particular importance were sessions helping to identify areas where international collaboration can further enhance technical excellence. One of the key outcomes of the conference is to develop an international forum, where both marketing opportunities and technical knowledge can be more easily shared across all countries.

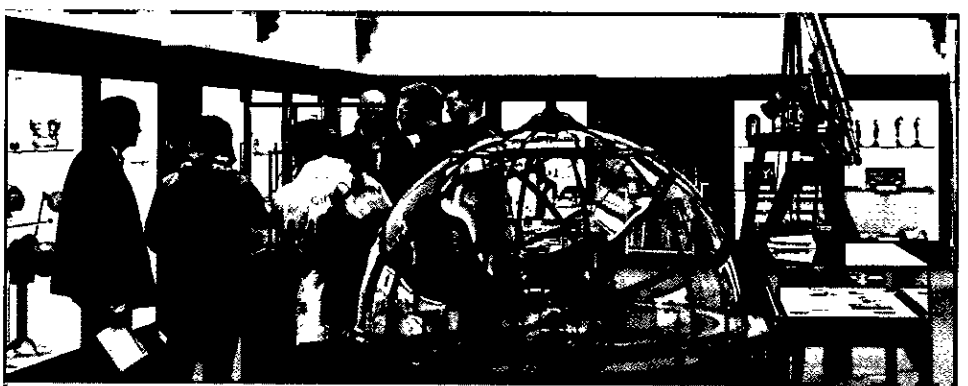
The conference made full use of being hosted in Cambridge, dining at both Lucy Cavendish and Darwin Colleges in the evenings, and visiting the Lord Rayleigh exhibition at the Whipple Museum of the History of Science. Lord Rayleigh, whose textbook *The Theory of Sound* was first published in 1877 and still forms the basis of the science of acoustics today, was Cavendish Professor of Physics in Cambridge as well as a Nobel Prize winner. Delegates also visited the site of the new Department of Materials Science and Metallurgy, which Ramboll are currently designing for the University of Cambridge.

The highlight of the event for many was a lecture by Professor Dame Ann Dowling, a Fellow and medal winner of the Institute, who specialises in combustion, acoustics and vibration. She described her work on the 'Silent Aircraft Initiative'; a unique project in that the starting point for a new concept in aircraft design is low noise outside airport boundaries and increased fuel efficiency (23% lower than the current Boeing 777). This has led to a very different airframe as well as engine types and locations compared with the conventional 'tube and wing' design.

The conference concluded with a guided tour around London's Olympic Park where delegates viewed the various venues for the Games and were informed of the legacy plans.

Contact Raf Orlowski **raf.orlowski@ramboll.co.uk** for more details about Ramboll Acoustics.

Dinner at Lucy Cavendish College



Visiting the Lord Rayleigh exhibition

International Ramboll Acoustics conference delegates

New options available for Rion NL-52 (Class 1)/NL-42 (Class 2) Sound Level Meters

Improvements bring 'significant added functionality'

The new Rion NL-52 (Class 1)/NL-42 (Class 2) series were launched in June 2011 with the NX-42WR audio recording option. The meter has proved popular for environmental noise surveys, especially for windfarm work. The ability for the meter to simultaneously measure processed values (10 minute L_{Aeq}, L_{Amax} and percentiles for example), 100 msec samples and to record periodic, level triggered or even continuous uncompressed and calibrated wav files (with the NX-42WR option) makes it an excellent choice for baseline and/or compliance monitoring, especially when coupled with the Rion WS-15 outdoor protection for the microphone and ANV Measurement Systems' weather resistant housing for the meter.

Rion have now released the NX-42RT octave and third octave option for the NL-52/42. With NX-42RT installed the instrument will also measure processed values (10 minute L_{Aeq}, L_{Amax} and percentiles for example) and 100 msec samples but this option enables each parameter to be measured and logged in octave or third octave bands. NX-42RT (the octave/third octave option) can also be run simultaneously with the audio recording option (NX-42WR) providing an incredibly powerful means of measuring and logging Class 1 (or Class 2) data in a small, battery powered unit.

NX-42RT adds significant additional functionality to the NL-52/42. You can, for instance, simultaneously measure and log $L_{Amax\ Fast}$ $L_{Amax\ Slow}$ and unweighted octaves or simultaneously measure and log L_{Aeq}, L_{Cpeak} and unweighted octaves - perfect for both environmental and health and safety applications. NX-42RT provides enormous flexibility because the time and frequency weighting of the Main Channel All Pass, the Octaves/Third Octaves and the Sub-Channel can all be independently set. This provides, for instance, the ability to measure the unweighted third octave or octave band levels corresponding to the L_{Amax} of a particular measurement period.

Although the NL-52/42 is physically no larger than the NL-31/32 series which they replace, the backlit 400 x 240 colour display shows the octave/third octave bands really clearly. The clarity of the graph can be enhanced by choosing a reduced display range (the measurement range remains 113 dB but you can choose a smaller range to display in order to make the octave/third octave graph clearer).

The NX-42RT (octaves/third octaves) and NX-42WR (audio recording) are easily installed by the user from SDTM cards. This has several advantages. There is no requirement to send the meter back to the manufacturer/supplier to get it upgraded, the options can be swapped between meters and owners of the basic instruments (NL-52/NL-42 with NX-42EX, which is generally pre-installed on meters supplied to the UK) can hire the options from ANV Measurement Systems' hire fleet.

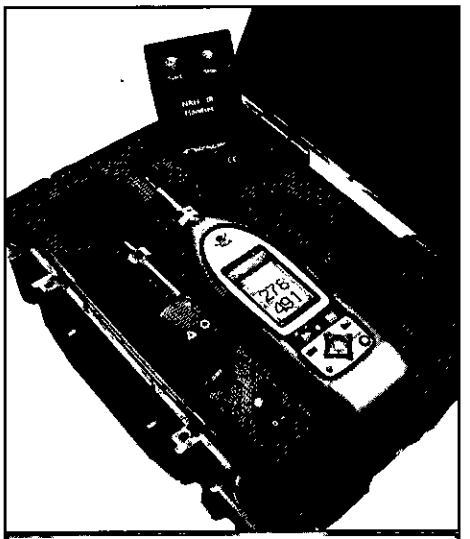
Rion's new AS-60 Data Management Software has made displaying data and reviewing data and audio from the NL-52/42 extremely quick and easy (and it can be used with data from the NL-31/32 series of sound level meters). Although you can always pull data from the NL-52/42/32/31 directly into ExcelTM, with AS-60 you simply drag and drop the folders (from up to 8 instruments!) containing data onto the AS-60 icon and the data and audio are pulled into this intuitive software automatically (and you can export it to ExcelTM from AS-60 painlessly should you wish to do so). AS-60 can be used to synchronise and simultaneously review the broadband data and audio from up to 8 Rion instruments. It's a fantastically quick way of reviewing data from multiple measurement positions for large-scale measurement exercises.

Rion have now introduced AS-60RT which offers data management and reporting for octave/third octave data recorded on the NL-52/42. In addition to the functions offered by AS-60, AS-60RT simultaneously shows the measured octave or third octave bands and the level time display (of overall level and/or other selected frequency bands). Furthermore AS-60RT will calculate the octave or third octave bands (depending on what has been measured) between two user-selected cursor positions. It's intuitive and simple and designed for cutting and pasting directly into reports.

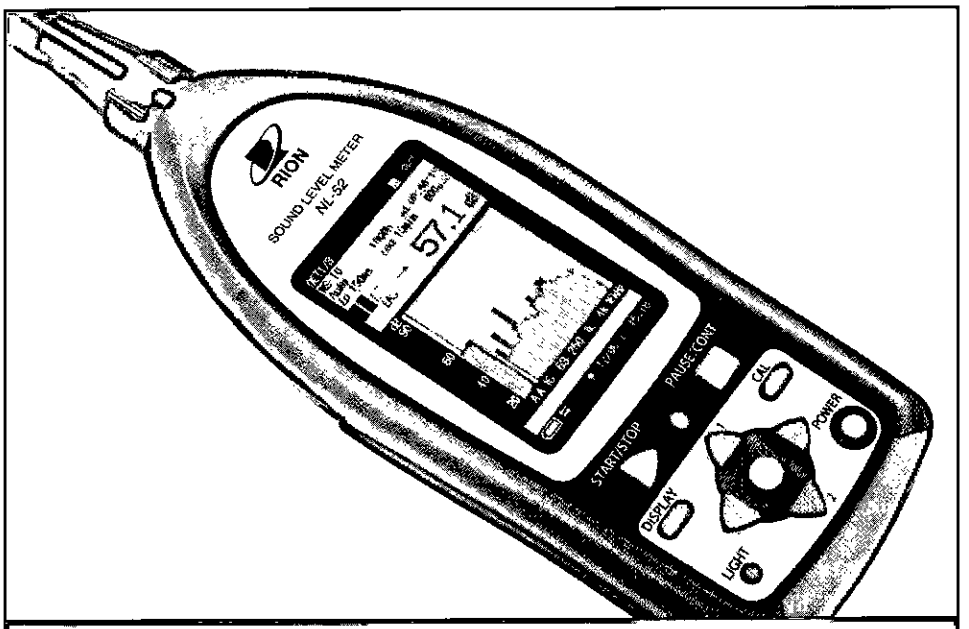
In addition to the self-standing instrument format, the NL-52 plus options are available with weather protection for long term monitoring and in the NNR-03 Nuisance Recorder for which the superb quality uncompressed wav files, up to 1 minute pre-trigger and quick and intuitive software are proving to be particularly popular.

For further information contact ANV Measurement Systems,
info@noise-and-vibration.co.uk
tel: **01908 642846**

continued on page 48



NNR-03 nuisance recorder



Rion RL-52 with new NX-42Rt option

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Committee meetings 2012

DAY	DATE	TIME	MEETING
Thursday	12 January	11.30	Meetings
Tuesday	24 January	10.30	Diploma Tutors and Examiners
Tuesday	24 January	1.30	Education
Thursday	26 January	10.30	Membership
Thursday	9 February	11.00	Publications
Thursday	16 February	11.00	Medals & Awards
Thursday	16 February	1.30	Executive
Thursday	1 March	10.30	Engineering Division
Tuesday	6 March	10.30	Diploma Examiners
Thursday	**8 March**	**11.00**	**Council**
Monday	2 April	11.00	Research Co-ordination
Tuesday	3 April	10.30	CCWPNA Examiners
Tuesday	3 April	1.30	CCWPNA Committee
Thursday	19 April	11.30	Meetings
Thursday	3 May	10.30	Membership
Thursday	17 May	11.00	Publications
Tuesday	22 May	10.30	CMOHAV Examiners
Tuesday	22 May	1.30	CMOHAV Committee
Thursday	29 May	10.30	Engineering Division
Tuesday	29 May	10.30	ASBA Examiners
Tuesday	29 May	1.30	ASBA Committee
Wednesday	20 June	10.30	CCENM Examiners
Wednesday	20 June	1.30	CCENM Committee
Thursday	21 June	10.30	Distance Learning Tutors WG
Thursday	21 June	1.30	Education
Thursday	28 June	11.00	Executive
Thursday	**12 July**	**11.00**	**Council**
Thursday	19 July	11.30	Meetings
Tuesday	7 August	10.30	Diploma Moderators Meeting
Thursday	6 September	10.30	Membership
Thursday	13 September	11.00	Executive
Thursday	**27 September**	**11.00**	**Council**
Monday	1 October	11.00	Research Co-ordination
Thursday	4 October	10.30	Diploma Tutors and Examiners
Thursday	4 October	1.30	Education
Thursday	11 October	10.30	Engineering Division
Thursday	18 October	11.00	Publications
Thursday	1 November	10.30	Membership
Tuesday	6 November	10.30	ASBA Examiners
Tuesday	6 November	1.30	ASBA Committee
Thursday	8 November	11.30	Meetings
Thursday	15 November	11.00	Executive
Wednesday	21 November	10.30	CCENM Examiners
Wednesday	21 November	1.30	CCENM Committee
Tuesday	4 December	10.30	CCWPNA Examiners
Tuesday	4 December	1.30	CCWPNA Committee
Thursday	**6 December**	**11.00**	**Council**

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.

Conference programme 2012

26 January 2012
Organised by the Welsh Branch
Wind Turbine Noise
SWALEC Stadium, Cardiff

1 March 2012
Organised by
North West Branch
Sustainable & Renewable Energy
Marriott Victoria & Albert Hotel, Manchester

21 March 2012
Organised by Measurement & Instrumentation Group
Environmental Noise Propagation-definitions, measuring and control aspects
The Royal Society, London

23-27 April 2012
ACOUSTICS 2012
Nantes, France

21 May 2012
Organised by the Musical Acoustics Group
The King of Musical Instruments - Acoustic Challenges
National Museum, Cardiff

2-6 July 2012
Organised by the Underwater Acoustics Group & ECUA Committee
ECUA 2012
Heriot Watt University, Edinburgh

14-16 November 2012
Organised by the Electroacoustics Group
Reproduced Sound 2012
Brighton

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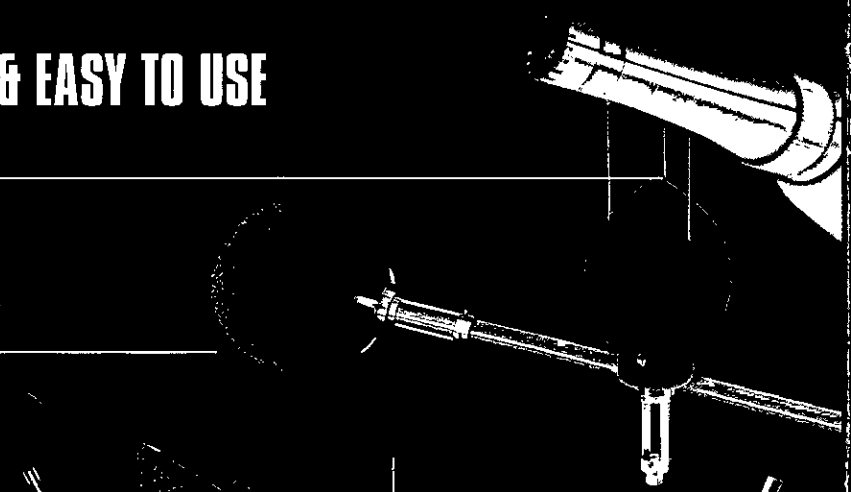

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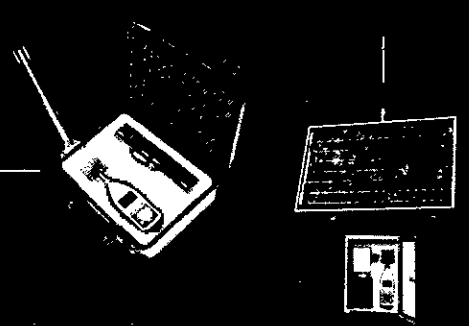

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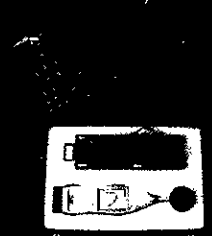
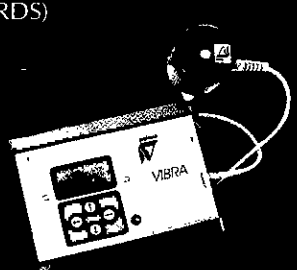


RION NA-28 (Class 1)

- Octaves & Third Octaves
- Audio Recording Option



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