

Vol 34 No 4 JULY/AUGUST 2009

ACOUSTICS

BULLETIN



in this issue... IOA Spring Conference

plus... 35th Annual Report

Conference preview - Euronoise 2009

Consultation response: amendments to
Environmental Noise (England) Regulations 2006

Bus-induced ground vibration

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ACOUSTICS

BULLETIN

Vol 34 No 4 JULY/AUGUST 2009

Contents

Institute Affairs

6

35th Annual Report of the Council

IOA Spring Conference

Conference preview - Euronoise 2009

Meeting reports

Technical Contributions

38

Comparison of the ground vibration levels induced by a bus travelling over a set of road cushions and a conventional speed hump

Noise on board ship

Acoustical design of the Amaryllis Fleming Concert Hall

The problem of noise created by rainfall on profiled metal roofing systems

News & Project Update

45

Book Reviews

47

Letters

48

Product News

48

Committee meetings 2009

50

List of sponsors

50

Meetings Programme 2009

50

List of advertisers

50

Front cover photograph: This year's Spring Conference was held for the first time at Dunchurch Park, a conference centre and hotel in rural Warwickshire, near Rugby. A mixture of Victorian splendour and modern functionality, the hall sits in its own extensive gardens, and the excellent weather gave the opportunity to enjoy them when there was a lull in the busy programme of presentations.

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.

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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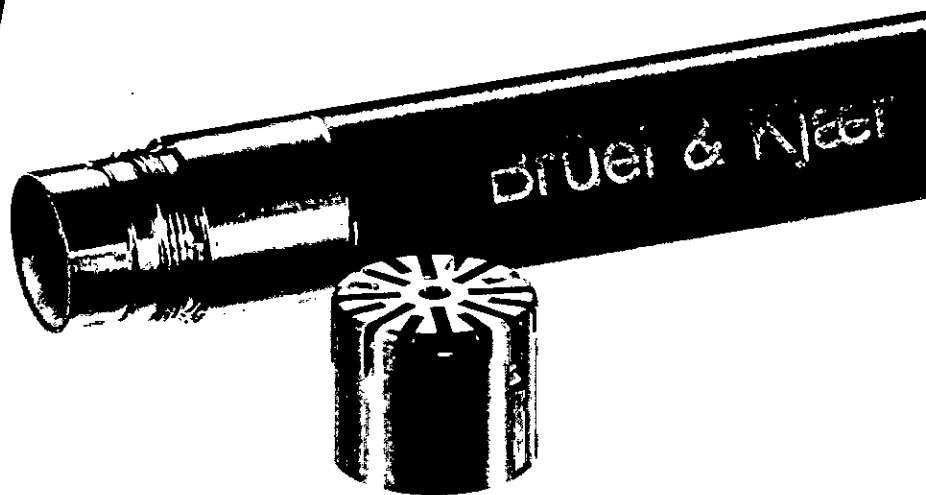
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Dear Members

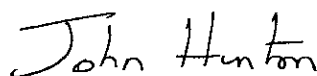
During this, the second of my two years as your President, I have made a commitment to attend at least one evening meeting at each of our regional branches. So far I have attended three, so only seven to go! I have three main reasons for attending these meetings. Firstly, to show my support for our branch network, which I think is even more important in the current difficult economic climate when employers may have problems financing more formal training for their employees. Secondly, to make myself available to the members of the IOA so that they can ask me questions and raise any issues that they may have with the Institute and its policies. The third reason is to seek volunteers to join a 'pool of experts'. The members of this pool would be called upon to help prepare IOA responses to, for example, government consultations. Since becoming President I have become acutely aware that most of the responsibility for this important work falls to a few members of either our Environmental Noise group or our Building Acoustics group. In my view this is clearly unsustainable and a solution would be for the Institute to form a pool of members from which individuals could be invited to contribute to preparing responses on an ad hoc basis. If you would like to volunteer please e-mail our Chief Executive at kevin.macan-lind@ioa.org.uk.

I am pleased to inform you that the Institute has recently responded to the Defra consultation on proposed amendments to the Environmental Noise (England) Regulations 2006. The Environmental Noise group, under the new chairmanship of Steve Mitchell, prepared the response which is contained in this edition of the Bulletin.

I attended our Spring Conference, which had a strong emphasis on the development and implementation of the first round of noise action plans required by the so-called Environmental Noise Directive. I am pleased to report that the conference was well attended and well received. I thank all those involved in the organisation of the event and in particular Colin Grimwood who shouldered most of the responsibility.

During the conference the opportunity was taken to hold the Institute's Annual General Meeting where I was able to report on another excellent financial performance during the past year. During the meeting three new Ordinary Members of Council were elected, namely Paul Malpas, Ken Dibble and Louise Beamish, the latter being the Young Members' Representative. I look forward to working with them.

I recently had the opportunity to visit the Edinburgh International Conference Centre, the venue for the Euronoise 2009 Conference, Action on Noise in Europe, to be hosted by the Institute in October. I was impressed both with the location and quality of the venue and particularly with the amount and flexibility of the space that is available to us. At the time of preparing this letter all is looking well with the planning of the event. We have received around 570 abstracts and registration has started, so please register on-line! For further information on Euronoise 2009 please see page 26 of this Bulletin.



John Hinton OBE

PRESIDENT



35th Annual Report of the Council

For the year ended 31 December 2008

Achievements

The Institute has continued to serve the interests of its members through its established programmes in the areas of education, professional development, meetings and publications, and by providing representation in areas such as the Engineering Council, Standardisation and International affairs. Strategic development of the Institute continued to be a priority and various actions were implemented.

During the year:

- The young members' representatives group was formed. There are now young members' representatives on the majority of the regional groups and specialist group committees.
- The membership figure broke through the 3,000 figure - an all-time high.
- An ambitious programme of well-attended conferences and technical meetings was undertaken at both national and regional level, and included the 24th Reproduced Sound conference, held for the first time in Brighton.
- The Institute has put a great deal of effort into the organisation of next year's Euronoise conference. Taking place on 26-28 October 2009, further details can be found on the dedicated website www.euronoise2009.org.uk
- The Institute had a very successful year, both in terms of delivery of services to members, and also financially.
- The first presentation of the revised Diploma syllabus with only four (optional) specialist modules, a separate Laboratory module and an enhanced project started in September 2008.
- Thirteen formal applications for Chartered Engineer registration were submitted in 2008. These candidates presented themselves for Professional Review interview - nine were 'standard route' candidates.
- By September 2008, a total of 186 (including 17 re-sits) had been registered for the Diploma including a record number (56) for the Distance Learning Scheme mainly as the result of a successful inauguration of a DL centre in Dublin.
- The Institute learned that it will be organising the Tenth Congress of the International Commission on the Biological Effects of Noise. ICBEN 2011 will take place 24-28 July 2011 at Imperial College, London.
- A successful auditorium acoustics conference was held in Oslo in October, organised jointly with the Norwegian Acoustic Society. Future collaborations will include a conference in Ghent, Belgium with ABAV in 2010, and a conference with the SFA in 2012.

Standing Committees

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

Education Committee

The Diploma and Certificate courses have continued to recruit successfully and to provide education and training for both members and non-members. The education programmes and courses introduce many working in acoustics and associated professions to the Institute and help in the recruitment of new members.

In September 2008, a total of 186 (including 17 re-sits) had been registered for the Diploma including a record number (56) for the Distance Learning Scheme mainly as the result of a successful inauguration of a DL Centre in Dublin with Gary Duffy as Centre Coordinator (which recruited 21 candidates).

The first presentation of the revised Diploma syllabus with only four (optional) specialist modules, a separate Laboratory Module and an

enhanced project started in September 2008. To date distance learning notes for the new *General Principles of Acoustics* (units 1-5), *Building Acoustics and Regulation and Assessment of Noise* Modules have been written, edited and distributed. Specimen examinations for the new Modules have been prepared.

The Certificate of Competence Courses recruited as follows in 2007/8; Management of Hand-Arm Vibration 13 students (11 passes), Environmental Noise 191 students (159 passes), and Workplace Noise and Risk Assessment 72 students (55 passes). The Certificate of Proficiency programme in Anti-Social Behaviour (Noise), which is currently run only in Scotland by Bel Education and Strathclyde University, recruited 40 students (37 passes). Continuing the trend from the last few years, all programmes recruited fewer students than last year.

The Education Committee has set up a working group to consider the development of a new short course in Building Acoustics. There are continuing investigations of IOA involvement with a short course in Underwater Acoustics. The Committee has applied to the Institute's 'charitable aims' fund (a) to support examination fee waivers for Diploma candidates suffering genuine hardship and (b) to support an 'engineering education' acoustics project in schools. Formation of a sub-group is under consideration which will be responsible for coordinating acoustically-related schools activities.

Another issue that has been raised towards the end of the year was that of the postgraduate status of the Diploma. It remains an aim of the revised Diploma to meet National Qualification Framework requirements for post-graduate status. The Diploma continues to give (varying) exemptions for MSc course credits at three UK Universities. This matter is ongoing.

During the year the committee has re-accredited the Diploma Centre at NESCOL and the CCWPNRA Centre at EEF Sheffield.

The terms of reference of the Education Committee and its sub-committees were revised in 2008. The membership of the committee was revised also with a view to increasing its strategic function. The first meeting with the revised Education Committee membership was held in October. David Saunders resigned as Chair of the Committee after this meeting. Simon Kahn was approved by Council as the new Chair in December.

The Education Committee continues to be indebted to its members for their support, the work of the Education Manager, and for the assistance provided by members of office staff.

Engineering Division Committee

The committee met three times during the year. Two internal audits were carried out, with no non-compliances identified. The number of initial enquiries for registration from Institute members remained strong (at 74) and a record number of candidates presented themselves for interview. Presentations on Engineering Council registration were given to consultancies and to a Young Members meeting and a Central branch meeting.

Thirteen formal applications for Chartered Engineer registration were submitted in 2008. These candidates presented themselves for Professional Review interview - nine were 'Standard Route' candidates, holding accredited degrees, and four were 'Non-standard Route' candidates with diverse backgrounds, including non-accredited acoustics degrees. Eleven candidates were successful. The two other candidates were invited to re-submit after a further period of professional development. Two formal applications for Incorporated Engineer registration were submitted in 2008, the first such applications for some time. Both were 'Standard Route' candidates and both were successful. Most of these fifteen candidates came from the acoustical consultancy sector, but one came from a local authority background and one was a university staff member.

The Engineering Council visited the Institute again in September to introduce the successor to David Morgan, who has chaired our licence renewal visits for several years. They commended the work of the committee and the quality of our new registrants and they encouraged us to increase the numbers of members seeking registration. They also supported our plans to promote EngTech registration among IOA Technician Members.

Medals and Awards Committee

The Spring Conference 2008 provided an opportunity to present several of the Institute's medals and awards. Christopher Harrison received the Institute's premier award, the Rayleigh Medal (2008), for his work in underwater acoustics, and Professor Jian Kang received the Tyndall Medal (2008) for his achievements in acoustics. This conference had a strong theme on communicating on acoustics issues and it was most appropriate that we were able to present the Award for Promoting Acoustics to the Public to Wendy Sadler (2006) and to David Sharp (2007). Past Presidents Mike Ankers and Bernard Berry were presented with their Honorary Fellowships and finally Bob Peters was presented with his Award for Services to the Institute.

Graduation day at the Institute of Sound and Vibration Research (ISVR) was the event chosen to present Anne Wheatley with the D W Robinson Prize as the writer of the best ISVR MSc dissertation in 2008.

The Underwater Noise Measurement, Impact and Mitigation Conference held in October 2008 provided the opportunity for us to present the prestigious A B Wood Medal and attendant prize to Judith Bell, from Herriot Watt University, and for her to present her Medal Lecture on 'Modelling of high frequency sonar systems'.

A host of medals and awards was presented during the Conference Dinner at the Autumn Conference 2008. Three were presented between the first and second courses, three between the second and third courses, and four before coffee. This arrangement seemed to work quite well. In the first session Bob White was presented with the Institute's Engineering Medal for his outstanding contribution in the field of acoustical engineering, Richard Collman was presented with the Award for Promoting Acoustics to the Public 2008, and Michael McKane was given the Institute's Diploma Prize for 2008. During the other sessions Keith Broughton, Richard Tyler and Andy Watson received awards for Services to the Institute and David Bull, Ian Campbell, Tony Jones and Geoff Kerry were awarded Honorary Fellowships.

Finally, the Reproduced Sound 24 Conference, held in November, provided an opportunity to present the Peter Barnett Memorial Award for 2008 to David Griesinger for his work in the field of electro-acoustics, the D W Robinson Prize 2007 to Jas Sandu, and the 2008 ANC prize for the best paper presented by a young person at an Institute conference to Filippo Fazi.

Meetings Committee

The Meetings Committee met four times in 2008. There has been no change this year to the membership of the committee. The search for additional committee members continues.

The committee presided over the organisation of 16 meetings covering a wide variety of topics and two above the target of 14. The main 'strategic' topic of discussion for the committee was the revision of the Meeting Schedule which sets clear guidance for regional branches and specialist groups on the number and type of meetings each year that the committee would like to see organised.

The schedule was accepted and groups and branches are already responding positively. The committee also proposed a nominal target for financial viability of events, which was acceptable to Council, and which has been achieved in the year.

Membership Committee

Four meetings were held throughout the year to review 363 new or upgrade applications of which 329 were successful. There were eight new Sponsor members and one new Fellow. There were almost equal

numbers of Corporate Member and Associate acceptances. Resignations during the year numbered 179 but there was a net gain over the year leaving the Institute with 2961 members at the end of 2008.

There were at least 10 attendees per membership meeting to review the applications and two new members joined the committee. Rob Hill retired after 28 years as secretary of the Membership Committee having served since its inception in 1980.

The Membership Committee also forms the disciplinary panel and five cases were received in 2008, two continuing into 2009.

Undergraduate students on acoustics courses will be offered free membership. Conference organisers will have the option to offer one year's free membership to Institute conference speakers from overseas as a mark of appreciation. New members (and upgrades) will be entitled to a 50% reduction in the conference fee for the ensuing year.

The age limit for the TechIOA grade will be removed, subject to a by-law change. The Council approved the option to review applications for student and Affiliate grades by committee members electronically outside the regular meetings, papers being distributed in encrypted form.

The membership officer continued to develop the members' benefits e-group under the umbrella of the committee. Also under the Membership Committee a working group has been set up to make proposals on how to generate a CPD culture within the Institute.

The time given by many of the committee members outside of the meetings to membership business over the year, has been much appreciated.

2008	HonFIOA	FIOA	MIOA	AMIOA	Tech	Affil	Student	Sponsor
Applicants		9	132	154	20	20	20	8
Elected	2	7	112	142	16	26	20	8
New Applic	2	1	43	130	16	26	20	8
Resigned		8	47	63	5	13	32	1
Deceased	1	1	7					

Publications Committee

The primary focus of the committee during 2008 was the design of the Institutes' new website. There has been much work going on behind the scenes for this, and good progress made through the year. The committee is seeking to have the final issues resolved before a launch in early 2009.

The themed issues of Acoustics Bulletin have had a good response, and this continues to be produced to a high standard, with reporting of the Institutes' meetings and affairs, and a broad selection of technical contributions. The electronic Acoustics Update has also had a good response, and successfully runs in parallel with the Bulletin, providing an excellent summary of Institute business and news items.

The income from advertising in the Bulletin, the Register of Members and the website continues at a very healthy level.

In addition, the Committee has been considering news feeds, web-forums and the on-line publication of conference papers, and it is preparing to re-launch the buyers guide. Also, IOA groups have been set up on the social networking sites Facebook and LinkedIn, with a steady increase in the number of interested people.

There have been several changes in committee membership over the year, including a new Chairman and Secretary. Thanks go to all members of the committee, who have put in sterling work throughout the year.

Research Co-ordination Committee

During 2008 the Research Coordination Committee (RCC) had two

continued on page 8

35th Annual Report of the Council - continued from page 7

meetings. Continuing activities include liaison with Research Councils (particularly EPSRC) and with Government Departments sponsoring acoustically-related research. Dr Prabhat Sakya Whyte has replaced Dr Edward Whyte as the EPSRC representative on the Committee. Other new members elected during 2008 included Dr Shahram Taherzadeh (Open University), Prof Jian Kang (Sheffield), Dr Eleanor Stride (UCL) and Prof Peter Thorne (Liverpool).

The liaison with DEFRA continues to be important and Richard Perkins has continued as their representative on the committee. DEFRA hosted both of the meetings in 2008.

At the meeting in November, the RCC undertook to assist with all research-related IOA meetings. The current agenda includes Euronoise 2009, a joint meeting with ABAV in 2010 and a joint meeting with SFA in 2012.

At the December meeting there were discussions about the possibilities for obtaining large grants (platform, portfolio and multi-institutional) from EPSRC.

During 2009, RCC will carry out a web-based survey of acoustically-related research (involving IOA members and non-members).

Specialist Groups

The Institute reflects the broad spectrum of the science and application of acoustics and several Specialist Groups exist to foster contacts between members of the various specialisms.

Building Acoustics Group

The Building Acoustics group remains very active and continued to strive to provide well attended and interesting events for members during 2008. Five key events were organised or strongly contributed to, and a number of articles and contributions were made to Acoustics Bulletin and the industry press to raise the profile of building acoustics.

The meetings were (attendances in brackets):

- 20 February 2008 - Soundscapes and aural architecture, at RIBA London (56)
- 10/11 April - Spring Conference, University of Reading (90)
- 17 May - AGM at Capita Symonds offices in Holborn
- 8 June - BAG and Scottish Branch consultation meeting on proposed amendments to Section 5 of Building (Scotland) Regulations 2004 (35)
- 11 September - Sustainable Acoustic Materials, at CIBSE London (36)
- 3 - 5 October - Auditorium Acoustics Conference, Oslo (194).

Sustainability remained high up the agenda, and the meetings in February and then September identified the need for the Institute to consider whether guidance could be provided to acousticians in this area. This has prompted a working group to be set up to investigate further. The Spring Conference was very well received by younger members, which it aimed to cater for strongly, and it is intended to carry the policy forward to future events. The Auditorium Conference in Oslo provided a highlight and truly international biannual event, which again was a great success. These high quality events are only possible because of the committee's dynamic efforts and members are thanked for their continued support and contributions. The committee remains vigilant for hot topic areas, and members who are willing to help organise them. Please feel free to contact the secretary if you want to contribute. We look forward to an exciting year ahead for all members interested in Building Acoustics.

Electro-acoustics Group

The Electro-acoustics group's main activity this year was the organisation of the annual Reproduced Sound Conference. The 24th in the series was held in Brighton following consultation between attendees, the committee and IOA staff. Attendance rose again to a total of 132, a small increase on the previous year primarily represented by a further increase in students responding to our

attractive student conference fee. Younger members will be the future lifeblood of our industry and students made up nearly 35% of those attending. This was achieved while balancing the budget.

It was gratifying as well for the committee to have an overflow of interesting papers available on the day set for choosing them, resulting in a well-balanced and varied programme.

The RS conference series specifically sets out to provide extensive networking and discussion time when topics of the day can be chewed over. The combination of venue and programme planning contributed greatly to the success of this aspect. The Peter Barnett Memorial Award was presented to David Griesinger in recognition of his long and instructive association with the electro-acoustics industry. An invited paper from Phil Nelson, Deputy Vice Chancellor of Southampton University, on multi-channel sound was well received. A demonstration from the youth wing entitled *Wii are the Music Makers*, by Matt Trevor from Derby University - using a games controller to control a multimedia environment - added spice to the conference and showed some of the directions that Reproduced Sound might follow in years to come.

The committee is currently planning the 25th conference and it has started discussions on other initiatives which it is hoped will start to take root over the next year. Plans being considered include a newsletter and industry training initiatives. Contributions from members on those topics would be gratefully received.

Environmental Noise Group

The Environmental Noise group continued to be very active throughout the year. The group was responsible for a one-day meeting on Transportation Noise Update in Birmingham in March. The group also contributed to the Spring Conference on Research.

Further progress on the IOA/IEMA Noise Assessment Guidelines has also been made, with input from members of the ENG, and it is hoped that the document will be published in 2009.

In addition, the ENG committee assisted Council with a number of consultation responses to external documents from Defra and other organisations, and continues to liaise with internal and external groups to ensure that the Institute keeps up to date with the latest issues in environmental noise.

The end of 2008 saw the committee undertaking the preliminary preparations for the 2009 Spring Conference, for which it has responsibility.

Measurement & Instrumentation Group

The group's committee has been responsible for organising a one-day meeting and the Autumn Conference during 2008.

2008 started with 'Playing Safe - Meeting the Control of Noise at Work Regulations 2005 in Music and Entertainment' held in the Barbican, London on April 16 with eight presentations giving a variety of information as to the problems created and some means of providing solutions to these difficulties that are now required under the legislation. There were 113 people crammed into the lecture theatre for these wide-ranging and thought-provoking presentations.

On October 21 and 22 we were in the Oxford Hotel for the Autumn Conference - 'See it Hear! - demonstrating current and emerging techniques for sound measurement', which through 17 presentations, one invited paper from Peter Mapp, and a workshop, admirably lived up to its title. The emphasis had been placed on practical examples of the techniques being discussed, and some exotic and spectacular demonstrations ensued, which all ran flawlessly, and gave good insights into what can be achieved in demanding measurement conditions. Officially 88 people attended the Conference, but only 36 of these were registered as delegates, which showed in the rather thin attendances at many of the presentations, which was a pity as their quality warranted a much larger audience.

continued on page 10

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35th Annual Report of the Council - continued from page 8

The Conference Dinner produced awards for two members of the group's committee. Ian Campbell was made an Honorary Fellow and Richard Tyler received a Distinguished Service Award.

Thanks goes to all members of the committee for the active roles they take in all aspects of the Group's activities and to Martin Armstrong for his secretarial skills on behalf of the Group. Following a campaign to recruit a new Young Members' representative, Angela Kourik was added to the Committee's members in December. In 2009, the Group is preparing to organise two one-day meetings, mindful of the effects Euronoise 2009 will have on the later part of the year, so it will continue to be busy.

Noise and Vibration Engineering Group

Five main committee meetings were held during the year, alternating between teleconferencing and actual meetings, held either at St Albans or in the North East. The main focus of committee meetings was the development of plans for events of interest to the NVEG membership.

Only one actual event was organised (though it ran on two occasions), a workshop entitled 'The role of consultants in occupational noise management', mainly organised by Tim Ward (HSE) and Dave Lewis (Unilever), whose efforts were supported by their respective organisations, but with assistance from other members of the committee. Ideas for other meetings were slow to develop because of time constraints, though a call for papers on 'Noise from alternative energy sources' has recently been sent out. The concept of an 'Acoustics Dinner Club' to discuss case studies in noise control is also being investigated.

In the search for ideas for new events, a consultation exercise was carried out in which about 30 NVEG members were contacted personally by phone or email: this produced some useful suggestions that will be followed up in due course. Also, two NVEG newsletters were produced during the year, and it is planned to issue this by email in future.

Joint IOA/IOP Physical Acoustics Group

2008 was unusual in the sense that the group held two Anglo-French Physical Acoustics Conferences (AFPAC '08 and AFPAC '09) in one year! These meetings, which are held annually on opposite sides of the Channel, are organised jointly with the GAPSUS group of the Société Française d'Acoustique. The first meeting, with over 40 presentations, was held on 16 to 18 January 2008 in Ashford Kent. AFPAC '09 was then held from 8 to 10 December 2008 in Arcachon, France to avoid a clash with major conferences in January 2009. Each meeting included presentations from six invited speakers who helped to expand the wide range of topics considered. As usual a strong theme running through the meetings was the practical application of acoustics and ultrasound to measurement problems in diverse areas.

A very successful AGM and Tutorial Day on Physical Acoustics were held at the Institute of Physics in London on 13 September 2008. This took the form of three extended lectures on the general theme of 'nonlinearity' given by distinguished invited speakers. These covered nonlinearity in tissue and medical ultrasound, bubble nonlinearity and nonlinearity in non-destructive testing. The extended format enabled the presenters to provide comprehensive reviews of their topics.

The AGM saw David Cartwright step down as chairman of the group after many years of dedicated leadership. The group has developed AFPAC and the Tutorial Day under David's chairmanship. The Bob Chivers Prize was presented to Dr Marco Morbidini, of Imperial College, for his paper on 'Prediction of the thermo sonic signal from fatigue cracks in metals using vibration damping measurements'.

Speech and Hearing Group

The Speech and Hearing group became more active in 2008. A successful one-day meeting on 'Speech and hearing in learning environments', which attracted speakers from the UK, Europe and the

USA and a total of 86 delegates was held on 29 January 2008, followed by the group's AGM.

The group also co-ordinated a half day Speech and Hearing session on at the Institute's Spring Conference held at Reading in April 2008.

In 2008 the group has focused on publicising the interests and concerns of the Speech and Hearing group to potential new members, and members have exhibited and attended small workshops and meetings organised by UK speech science and speech technology organisations (eg the 'UKSpeech' Network). The group aims to strengthen these links throughout 2009.

The broad range of interests encompassed by the group is now detailed on the Institute's website. Meetings are intended to be of interest to audiologists, speech and language therapists, and people working in speech perception, speech pathology, speech technology, and aspects of building and architectural acoustics which relate to speech and hearing. Anyone wishing to take an active role within the group should contact the group chair, Emma Greenland.

The committee met four times during 2008, and future events are currently being planned, including a tutorial workshop on 'Quantitative measurement techniques for speech and hearing sciences', along with a Speech and Hearing session at the Institute's Spring Conference 2010.

The group was also discussing involvement in a joint meeting with the Building Acoustics Group to discuss the revision of Building Bulletin 93 (Acoustic design of schools) to be held early in 2009.

The membership of the committee currently represents the broad range of interests of the speech and hearing group.

Underwater Acoustics Group

In 2008 the Underwater Acoustics group continued to concentrate on the promulgation of knowledge via its conferences.

International attendance at meetings such as that at Southampton in October helps to disseminate the importance of careful measurements of noise underwater, with the increasing concerns for wildlife. Entitled 'Underwater noise measurement, impact and mitigation' the meeting included speakers from Australia, Turkey, Portugal, Spain, and the USA including Hawaii. The generation of standards is at a very early stage compared with airborne acoustics. Standards have to deal with a wide range of species rather than the concentration on human responses.

At the same time, the use of relatively specialised topics means that conferences can avoid the complications of parallel sessions, which can give users a sense of frustration as they try to juggle the programme. The committee feels that conferences provide a useful contribution to technology and science development, supported by feedback received.

The regular committee meetings allow the experience of the members in attendance at the many other conferences in the field to help to maintain this position.

The ABWood medal for 2008 was presented to Dr Judith Bell after her presentation. The committee is concerned to improve the dissemination of knowledge of this long-standing award for future years. The next European award will be in 2010.

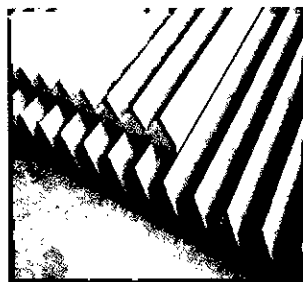
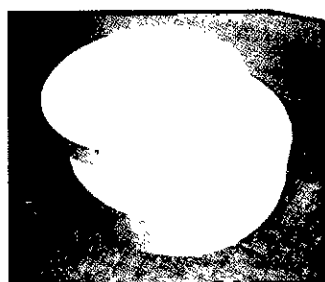
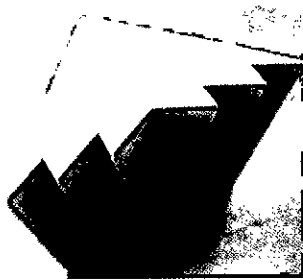
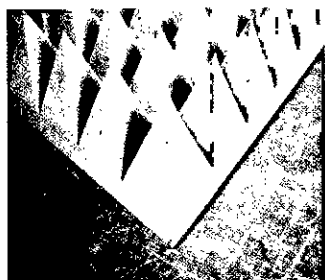
We were sorry to lose J Dunn who died in 2008, but he had the satisfaction of being awarded a commendation for his distinguished services in his lifetime.

The next meeting is the 5th International Conference on Bio-Acoustics in late March. Once again Loughborough is hosting this meeting organised by Paul Lepper and Peter Dobbins.

The committee is always looking for new and suitable topic areas - please do let us know if you have any ideas. We are also looking for individuals to come in and assist in the organisation of meetings. It is likely that number of current committee members will be taking on other responsibilities over the next few years, so it is important to recruit new and active members on to the committee.

Young Members' Representatives' Group

This year the Young Members' core group was formed with Louise Beamish as Chairman and Emma Keon as Secretary. There are now



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young member representatives on the majority of the regional groups and specialist group committees.

The group of representatives met regularly in 2008 in order to form the core group and discuss ways to involve younger members within the Institute. The group is currently in the process of arranging its first one-day event targeted at those in the early stage of their career.

A group has also been set up to assist with the young members' area on the new Institute website.

Regional Branches

The Regional Branches of the Institute exist to further the technical and social activities of the Institute at local level.

Central Branch

The Central branch held three evening meetings during 2008 with an average attendance of 35. The meeting topics included noise from pop concerts, investigations of poor sound insulation and issues affecting younger acousticians. There was also a one-day visit to Intertek, Milton Keynes to look at consumer product testing. Thanks are extended to all the speakers and the venues for hosting the meetings.

Members of the Central branch continue to support the Setpoint Hertfordshire scheme to promote science and engineering in schools, with Richard Collman's 'Acoustic Ambassador' workshop winning best activity at the national STEMNET awards presented at the House of Lords.

The Annual General Meeting was held on 2 December 2008 at which David Watts was re-elected as Chairman and the remainder of the committee was unchanged. The committee has been very pleased with the way the branch has developed during 2008 and hope we can sustain this into 2009.

Eastern Branch

Over the year the Eastern branch committee has organised six technical meetings. These meetings had an average attendance of around 20 members and were organised from four committee meetings.

As always, the committee members tried to provide a wide cross-section of topics with venues spread across the Eastern Region as much as possible.

Our first meeting was an evening meeting in February at Colchester Institute entitled 'School: A sound learning environment?' by Bridget Shield. This was followed in April by an afternoon meeting at the Animal Health Trust in Newmarket delivered by Natalie Webster on 'The use of ultrasound for medical purposes'. In May, Karen Finch gave an illustrated talk on 'Hearing loss relationships and today's technology' at Colchester Institute. After the summer break our branch members returned in early October to enjoy an evening meeting at Colchester Institute where Paul Goring delivered a very interesting talk on 'Investigation of poor sound insulation'. This was closely followed in late October by an afternoon meeting at Lotus Cars, Norfolk for a 'Visit to Lotus Engineering NVH Department' delivered by Colin Peachey. Finally our AGM was combined with our final meeting in November at The Holiday Inn, Ipswich when John Seller delivered a lecture on 'The appeal of clay target and rifle shooting noise'.

As a committee we have had a difficult year with a number of planned meetings having to be changed, some at short notice. All committee members, especially the secretary Colin Batchelor, whom these changes affected the most, should be thanked for their dedication in ensuring that a reasonably full programme of meetings has been maintained throughout the year.

Pleasingly, we have seen an increase in the number of members

continued on page 12

35th Annual Report of the Council - continued from page 11

attending the meetings, with a general increase in attendance by younger members. As members, we all need to try and attend as many meetings as we can to keep our active branch buoyant. It is also essential that we encourage new members to join our committee to enable the organisation of all the regional functions to continue, so please feel free to put your name forward to any committee member if you wish to help. The Institute requires all branches to have a young members' representative so it is with the younger members that we must encourage new committee members together with more experienced members.

Irish Branch

The year 2008 saw three events organised by the Irish branch. In February a well-attended one-day meeting entitled *Windfarm Noise 4* was held in Armagh with presentations being given by local and country-wide representatives of environmental health departments and consultancies.

In October an evening meeting was held in order to gauge branch members' opinions as to the content for a response to the Noise Issues Consultation Paper issued by the Irish Department of the Environment, Heritage and Local Government.

In November we held the third Annual Gerry McCullagh Memorial Lecture. A most interesting presentation entitled '*Pop concerts - Sound management and control*' was given by Jim Griffiths of Vanguardia Consulting. As in previous years, it was a pleasure that Gerry's wife (Rita) and his mother (Jean) attended the lecture. As well as having an invited guest giving a presentation on their chosen topic, the branch also presented a certificate for the best performing Diploma student resident in Ireland (both north and south). In 2008 the certificate was presented to David Crawley of White Young Green (Dublin), and the branch committee welcomed James Mangan on board.

London Branch

Owing to the growing numbers of attendees we had to move the normal evening meeting venue to Capita's larger office in Proctor Street. Attendances at London evening meetings have swelled to a staggering 70+ with typical numbers in the region of 45 to 50.

We have had another very busy year which consisted of ten events: seven evening meetings, a half-day visit, a one-day conference and our annual dinner.

As usual, the topics for the evening meetings have been varied in nature starting with the most popular talk of the evening meetings from Mark Murphy of Vanguardia who discussed the acoustics of the world's most popular music venue, the O2 (previously known as the Millennium Dome). This was followed by Simon Kahn of RPS who discussed the various facets of architectural acoustics. The topic of the next evening meeting was delivered by Dani Fiumicelli from Faber Maunsell who outlined the complex issue of the measurement of uncertainties. The final evening presentation before the summer break was given by Bernard Berry (Berry Environmental) who delivered a discussion on the topical subject of noise and health impacts. Following the summer break, Bernadette McKell (Faber Maunsell) travelled from north of the border to present her experience on the noise mapping projects in Scotland and this was followed in October by Robert Peirce of Vanguardia on the subject of noise control from pop concerts. The final evening meeting was given by Simon Kahn, his second appearance of the year, on room acoustics.

The one-day conference was held in March on the topic of *Noise nuisance*. There was a capacity attendance of around 80 delegates and papers were presented by authors from both public and private sectors. The opening paper was given by Helen Matthews from Defra on the subject of emerging strategy. Helen explained the current approaches to neighbour and neighbourhood noise, ambient noise strategies and statutory nuisance and considered the potential

advantages and difficulties of embracing a single noise strategy. The papers that followed gave diverse views on the approach to assessing nuisance (objective and subjective) as well as looking at the role of the expert witness and case studies. A lively debate followed and a full report was published in the *Acoustics Bulletin*.

Like the one-day conference, the half-day visit proved another sell-out which is not surprising as it was an exclusive behind-the-scenes visit to the Royal Festival Hall. Taking place one year after the venue reopened its doors, the visit provided an opportunity to learn more about the details of the extensive two-year redevelopment which included a complete overhaul of the main auditorium acoustics. The afternoon began with a talk from Ian Blackburn, the Capital Projects Director at the Southbank Centre who was responsible for the redevelopment project. A presentation was then given by the project's acoustical consultant, Larry Kirkegaard, who gave an inspiring and all-encompassing presentation which began by describing the problems of the old hall from a musician's, as well as an acoustician's, perspective. The final feature of the afternoon was the opportunity to hear the results of the refurbishment by listening to the UK premier of Philippe Leroux's *Voi (Rex)*, a short work for soprano voice, six instruments (piano, percussion, violin, cello, flute and clarinets) and electronics, following a discussion with the composer. This was an exceptional visit.

The annual dinner was held in November in the 'Bleeding Heart' restaurant renowned for its excellent French cuisine and friendly ambience. We have successfully held several other dinners at this venue and it has always proved popular. This year's after dinner speaker was Jim Griffiths who gave an insight into the world of acoustics in respect of the concert and sporting industries. The acoustics of Madonna, Michael Jackson and Queen thrown in with Arsenal and Spurs provided a light-hearted close to the proceedings.

Exciting and interesting talks are already planned for 2009 and we would like to take this opportunity to thank all the members of the London Branch committee and of course Kevin and Linda at HQ for all their invaluable support throughout 2008. We would also like to thank all London Branch members for their continued support at the meetings which has boosted our attendance to record figures.

Midlands Branch

2008 was another successful year for the Midlands Branch and was judged as a 'resounding' success. Five worthwhile meetings were organised, thanks to our chairman and the members of the committee who behind the scenes keep a full and varied programme for the region. These events do not get off the ground by themselves, and a responsibility lies with all of us to put something back into the Institute. The five well-attended meetings again covered a wide and interesting range of subjects:

March 2008 *Outdoor sound prediction: grounds for improvement* - Keith Attenborough, Institute of Acoustics, at Scott Wilson offices, Nottingham

May 2008 *Sustainable acoustics* - Richard Greer, Arup Acoustics, at Scott Wilson offices, Nottingham

July 2008 *Environmental noise barriers* - Harry Frew, Environmental Tree Services, at the Arup Campus, Solihull

September 2008 *Presentations of the best IOA Diploma projects of 2007/2008* - Heather Billin and Iain Patterson-Stephens, at the University of Derby

November 2008 *Issues regarding the application of BS8233 and PPG24* - Stephen Turner, Bureau Veritas (meeting including the AGM), at Loughborough University

The branch committee additionally held its traditional 'November Curry' planning meeting where the next year's events are planned. We are expecting another full programme of six meetings, one every other month.

North-west Branch

At the start of 2008, in conjunction with the University of Salford, the North-west branch hosted a one-day meeting on 'The improvement of

the management of helicopter noise'. The meeting provided an opportunity for members and other interested parties to contribute to or comment on a report being prepared by the university for the Department for Environment, Food and Rural Affairs (Defra). The motivation for the project included a perceived lack of information in connection with helicopter noise, and in particular regarding to whom complaints should be addressed, and clarification was also sought on remediation and mitigation. Comments and points raised by speakers and participants have now been incorporated in the final report.

In June, we had an opportunity to review the proposed revision to BS5228 'Noise and vibration control on construction and open sites'. This well-attended meeting was led by Paul Freeborn of Bureau Veritas and Dr David Hiller of Arup Acoustics. The proposed changes to the BS were discussed, including the thorny issue of setting limits.

Our AGM at BDP in September was ably supported by a presentation on 'Noise and health issues'. Dr Andy Moorhouse of Salford University kindly stepped in at the last minute for Bernard Berry and provided food for thought on a number of aspects.

Finally, in November, Peter Mapp gave us a presentation on 'Are my dB's too loud or not loud enough?' in what became a very crowded Arup meeting room. Peter described to a packed audience the difficulties of setting allowable levels from public address systems, particularly those at open air railway stations.

As every year, we are grateful to all those who provided venues for hosting the meetings and, of course, assisted with the organisation of the meetings. Thanks also to Bureau Veritas, where Paul Freeborn arranges a venue and refreshments for committee meetings, and to all the committee who have been joined by some younger members and are looking forward to new ideas. Special thanks are owed to Paul Michel who allegedly has been secretary for more than ten years, but who keeps on going with his good humour and relaxed approach.

Scottish Branch

2008 was a fairly quiet year for the Scottish branch in terms of meetings. Notwithstanding this a very important meeting was held at Heriot-Watt University in June to progress the consultation on Section 5 of the Building (Scotland) Regulations 2004. This meeting was chaired by Alistair Somerville and began with a short presentation on the proposed changes. This meeting was well attended and feedback from it was submitted to Scottish Government. Thanks are due to Alistair and Anne Carey for organising and facilitating the meeting at fairly short notice. There is ongoing communication between the Scottish branch and the Building Standards Division of the Scottish Government on this matter and the review is at a final stage. It is anticipated that it will not be too long until the revised regulations are in place.

Nicola Robertson continues in her post as our young members' representative. The secretary and treasurer of the Scottish branch remain unchanged. Many thanks to Andy Watson for continuing to look after Scottish branch financial matters, to Lilianne Lauder for her continued commitment as secretary and to committee members for their support during 2008.

Southern Branch

The Southern branch enjoyed a revival this year following the Annual General Meeting on 29 May 2008. Nigel Cogger was elected as chairman and Steve Gosling as secretary. James Healey, Alan Saunders and Andy Hayes were elected as committee members. The meeting was followed by a very well attended presentation 'Expert evidence - A view from the Bench', given by District Judge Philip Gillibrand who had recently passed judgment on a nuisance case involving significant noise evidence. The meeting was followed by a lively debate surrounding such matters.

Alan Saunders gave a presentation in November on methods for

continued on page 14



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- The ANC guideline documents and Calibration Kit are available to Members at a discount
- Your views will be represented on BSI Committees - your voice will count
- Your organisation will have the opportunity to influence future ANC guideline documents
- ANC members are consulted on impending and draft legislation, standards, guidelines and Codes of Practice before they come into force
- The bi-monthly ANC meetings provide an opportunity to discuss areas of interest with like minded colleagues or just bounce ideas around
- Before each meeting there are regular technical presentations on the hot subjects of the day

Membership of the Association is open to all consultancy practices able to demonstrate, that the necessary professional and technical competence is available, that a satisfactory standard of continuity of service and staff is maintained and that there is no significant financial interest in acoustical products. Members are required to carry a minimum level of professional indemnity insurance, and to abide by the Association's Code of Ethics.

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35th Annual Report of the Council - continued from page 13

assessing noise from skateboard parks. Alan outlined a review of tests that, when used together, can give an indication of the likelihood of complaints from a skateboard park.

South-west Branch

The committee met three times during 2008 and organised a number of branch meetings, two more formal meetings involving presentations and a social gathering for SW branch members.

The first branch meeting was held at the University of the West of England in May and consisted of two presentations, 'Managing transport emissions, M32 – a case study' by Steve Crawshaw of Bristol City Council giving details of the use of noise mapping software to investigate traffic management options and 'Smoking-related noise' by Tim Clarke, Bristol City Council, who presented a number of case studies related to the smoking ban and the provision of outdoor smoking areas.

There was a good turn-out for the social gathering held at one of Bristol's most popular harbour side venues, The Cottage Inn, Baltic Wharf, Bristol. A sunny July evening was spent besides Bristol Docks watching the numerous boats and waterside activities whilst enjoying 'a pie and a pint' and convivial acoustical chat.

The third meeting was in October on the topical subject of wind turbines. In the afternoon there was a visit to one of the three 2MW wind turbines on the Severn estuary at Bristol Port. Julian Werrett from the Bristol Port Company talked about the installation of the turbines and answered many questions about the practical aspects, whilst Gavin Irvine of Ion Acoustics was able to handle any questions about noise issues. This was followed by two related presentations in the evening, again kindly hosted by the University of the West of England. Gavin began by describing work he had done whilst at Hayes Mackenzie on the noise assessment undertaken for the very turbines visited earlier, and then covered the key requirements in the ETSU-97 assessment process and outlined the different approaches available to limit any noise impacts. This was followed by a presentation by Richard Perkins of Parsons Brinkerhoff who outlined the current position on the assessment of microturbines, and their potential inclusion as a permitted development for home owners.

The committee members would welcome ideas for future meetings from the membership in the region.

Yorkshire & Humberside Branch

In 2008 the Y&H branch held three meetings at the University of Bradford in January, at Arup Acoustics (Leeds) in April and at Cummins Turbo Technologies Company (Huddersfield) in May. At the January meeting Prof Peter Thorne of Proudman Oceanographic Laboratory presented a talk on the use of acoustics for monitoring sedimentation processes around the British coastline. At the April meeting Richard Greer of Arup Acoustics talked about novel approaches for sustainable spatial planning, responsible urban regeneration and creating good acoustic environments. At the May meeting Dr Sheng of Cummins focused on measurement, prediction and control of turbocharger noise and vibration. His talk was followed by a demonstration of the capabilities of an acoustical camera (Tony Shepperson of AcSoft) for the localisation and characterisation of prime sources of noise in turbochargers.

The branch committee has met regularly to discuss topics and venues for future meetings of the branch. The committee has been strengthened by the election of Will Martin of Arup Acoustics in Leeds as a deputy chairman of the branch.

TABLE 1: MEMBERSHIP

Grade	2007	2008
Hon Fellow	25	31
Fellow	197	187
Member	1526	1577
Associate Member	877	879
Affiliate	89	98
Technician Member	52	58
Student	65	41
Totals	2831	2942
Key Sponsor	3	3
Sponsor	33	37
Institutional Subscriber	29	29

TABLE 2: GROUP MEMBERSHIP

Group	2007	2008
Building Acoustics	953	1067
Electro acoustics	243	266
Environmental Noise	1293	1373
Measurement & Instrumentation	354	384
Musical Acoustics	186	216
Noise and Vibration Engineering	825	883
Physical Acoustics	128	138
Speech	125	157
Underwater Acoustics	138	139

TABLE 3: BRANCH MEMBERSHIP

Branch	2007	2008
Central	96	109
Eastern	263	263
Irish	134	143
London	664	711
Midlands	404	421
North West	363	383
Overseas	299	312
Scottish	156	176
South West	269	302
Southern	519	450
Yorkshire/Humberside	213	217

TABLE 4: DETAILS OF EMPLOYMENT

Employment Category	2007	2008
Architectural Practice	33	32
Consultancy	1177	1294
Education	290	216
Industry/Commerce	347	351
Public Authority	505	474
Research & Development	201	191
Retired	106	112
Other	91	83

TABLE 5: MEETINGS ATTENDANCE IN 2008

Topic, Date & Venue	Attendance
Speech & hearing in learning environments 29 January, London	78
Helicopter Noise 6 February, Salford	35
Soundscapes inside and outside future buildings 20 February, London	56
Windfarm Noise 28 February, Armagh, Ireland	52
Noise Nuisance 5 March, London	85
Transportation Noise Update 12 March, Birmingham	41
Spring Conference 2008 10-11 April, Reading	190
Playing Safe 16 April, London	113
Consultants in Occupational Noise 13 May, Bootle	28
Consultants in Occupational Noise 15 May, Colworth, Beds	22
Art of Being a Consultant 17 June, Southampton	42
Building Acoustics Materials towards Sustainability 11 September, London	36
7th Auditorium Acoustics 2008 3-5 October, Oslo, Norway	194
Underwater Noise Measurement, Impact and Mitigation 14-15 October, Southampton	104
Autumn Conference 2008 21-22 October, Oxford	88
Reproduced Sound 24 20-21 November, Brighton	125

TABLE 6: INSTITUTE PERSONNEL AT 31 DECEMBER 2008

COUNCIL

	Officers	Ordinary Members
President	Mr J F Hinton OBE FIOA	Dr K V Horoshenkov FIOA
President Elect	Prof T J Cox MIOA	Prof J Kang FIOA
Immediate Past President	Mr C E English FIOA	Dr M R Lester MIOA
Honorary Secretary	Prof V F Humphrey FIOA	Mr D N Lewis MIOA
Honorary Treasurer	Mr A W M Somerville MIOA	Mr P J Rogers MIOA
Vice President: Engineering	Dr B McKeil MIOA	Prof P D Thorne FIOA
Vice President: Groups & Branches	Mr S W Turner FIOA	Mr R G Tyler FIOA
Vice President: International	Prof B M Shield HonFIOA	Ms L J Webb MIOA
		Dr B J Williams MIOA
		Ms L D Beamish MIOA (co-opted)

COMMITTEES AND SUB-COMMITTEES

	Chairman
Education	Mr S W Kahn MIOA
- Diploma in Acoustics and Noise Control, Board of Examiners	Mr J G Walker HonFIOA
- Certificate of Competence in Environmental Noise Measurement	Mr D Trevor-Jones FIOA
- Certificate of Competence in Workplace Noise Assessment	Mr G Brown MIOA
- Certificate of Proficiency in Anti-Social Behaviour (Scotland) Act 2004 (IOA/REHIS)	Mr J Stirling (REHIS)
- Certificate in the Management of Occupational Exposure to Hand Arm Vibration	Mr T M South MIOA
Engineering Division	Dr B McKeil MIOA
Medals & Awards	Mr J F Hinton OBE FIOA
Meetings	Mr J P Newton MIOA
Membership	Dr B J Tunbridge MIOA
Publications	Mr A Lawrence MIOA
Research Co-ordination	Prof K Attenborough FIOA

SPECIALIST GROUPS

	Chairman	Secretary
Building Acoustics	Prof R J M Craik FIOA	Ms A L Carey MIOA
Electroacoustics	Mr S P Wise MIOA	Ms H M Goddard MIOA
Environmental Noise	Mr K M Collins MIOA	Ms N D Porter MIOA
Measurement & Instrumentation	Mr R G Tyler FIOA	Mr M J Armstrong MIOA
Musical Acoustics	Dr P F Dobbins FIOA	Vacant
Noise and Vibration Engineering	Dr M G Smith MIOA	Mr M D Hewett MIOA
Physical Acoustics (joint with the Institute of Physics)	Prof A Temple	Dr N Saffari
Speech & Hearing	Mrs E E Greenland MIOA	Dr G J Hunter MIOA
Underwater Acoustics	Dr P F Dobbins FIOA	Dr R A Hazelwood MIOA
Young Members' Representatives	Ms L D Beamish MIOA	Ms E Keon MIOA

REGIONAL BRANCHES

	Chairman	Secretary
Central	Mr D L Watts FIOA	Ms R H Canham MIOA
Eastern	Mr C L Batchelor AMIOA	Mr C M Pink AMIOA
Irish	Dr M R Lester MIOA	Mr S Bell MIOA
London	Mr J E T Griffiths FIOA	Ms N Stedman MIOA
Midlands	Mr P J Shields MIOA	Mr M Swanwick FIOA
North West	Mr P E Sacre MIOA	Mr P J Michel MIOA
Scottish	Mr A W M Somerville MIOA	Ms L Lauder MIOA
Southern	Dr N D Cogger FIOA	Mr S J Gosling MIOA
South-west	Mr T Clarke MIOA	Mr S Simpson MIOA
Yorkshire and Humberside	Mr D Daniels	Dr K V Horoshenkov FIOA

CHIEF EXECUTIVE:

Mr K M Macan-Lind

IOA Spring Conference

Environmental Noise Management in a Sustainable Society - Dunchurch Park, Rugby

Tuesday 28 April

No fewer than 112 delegates gathered in the pleasant surroundings of the Dunchurch Park Hotel and Conference Centre to hear and discuss the latest ideas on environmental noise management in a sustainable society. This article gives a brief summary of the papers presented.

The conference programme had been largely brought together by Colin Grimwood (Bureau Veritas) who is one of several long serving members of the Environmental Noise group of the Institute. Dunchurch Park was a new venue chosen carefully by IOA headquarters staff and the ENG committee to replace the Oxford Hotel, which had been the venue for some years for major ENG conferences.

Colin chaired the opening session and firstly introduced **John Hinton** OBE FIOA (Birmingham City Council) who gave a provocatively-titled presentation drawing from his recent experience as IOA President. His talk was called *Environmental noise - is the future going to be quieter?* Well, John was in a positive mood and the answer was 'yes' but there were several caveats. One of the main barriers that John identified was the continuing debate and seeming lack of agreement on the link between environmental noise exposure and health effects. However, he highlighted a number of reports due out over the course of this year that should move this debate forwards.

The keynote speaker was **Bernard Berry** (Berry Environmental) who spoke on *Dose-response relationships between noise exposure and health*. Bernard looked at the applications of dose-response relationships to health impact assessment and monetary evaluation. He provided a comprehensive overview of a growing field and concluded that sustainable development must consider the effects of noise on health. However, Bernard also reminded us that the evidence on dose-response relationships was mainly based on studies of road traffic and

aircraft noise. We still have very limited information on the health effects of railway noise and industrial noise.

Continuing with the health related theme, the next speaker was **Dani Fiumicelli** (Faber Maunsell) on *WHO night noise guidelines for Europe - Ssh! It's oh so quiet!* who, apart from displaying a particular penchant for female Icelandic popsters (and a missed opportunity for a musical introduction - where was Ken Dibble this year?) also displayed a healthy grasp of the bigger picture within which decisions have to be made. One slide in particular which has remained in the memory highlighted the problem of applying overly-stringent noise criteria where 'the social and economic consequences of action would be far greater than any advantages gained by reducing the proportion of the population bothered by noise'.

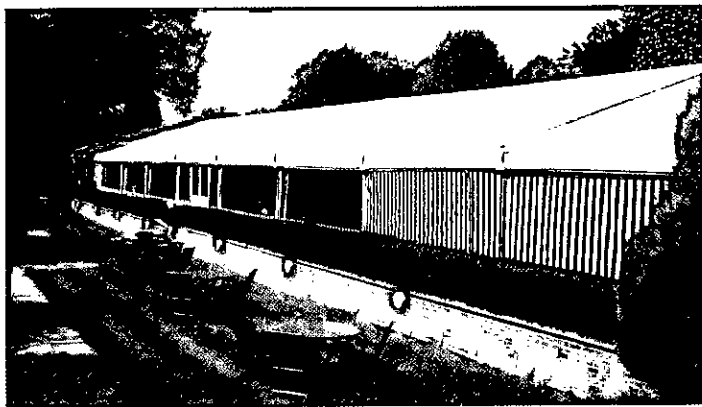
Next up was **David Leversedge** (RPS Planning and Development) and *WHO guidelines and night-time noise from music events*. His first slide showed Pete Townshend in full flight, and yes, another musical opportunity was missed. David overviewed the different criteria that he had seen applied at various night-time musical events around the country, many of which seemed to be objective measures that aimed to make music noise just audible outside noise-sensitive premises.

After a well-deserved coffee break in a delightful marquee surrounded by exhibitors Acoustic1, Acsoft, ANV Measurement Systems, Brüel & Kjær, Campbell Associates, and Casella CEL we returned to hear **Michael Eade** (EN Centre) speak on *The Licensing Act 2003 and noise control*. Michael informed delegates that the Act was meant to be deregulatory and that the application was meant to be a 'light touch' with an emphasis on a 'liberalisation of the entertainment sector' whilst still providing safeguards. At the end he posed a provocative question - are we overzealous with our use of noise conditions?

The final paper of the morning session was by Julian Trill and



The conference venue sits in extensive lawned gardens



No, not a wedding reception, an acoustics conference

Latha Vasudevan (NESCOT) entitled *An investigation into planning conditions used by UK Local Authorities to control noise levels from building services plant*. Latha delivered the paper which drew upon Julian's survey of Local Authorities and looked at the use of absolute and relative noise criteria, the control of tonal noise and the continuing influence of BS.4142 in this area. The written paper calls for further research on the issue of creeping background noise, one that was first highlighted in government planning guidance as long ago as 1973.

Lunch was in the marquee which, having been pleasantly set up in readiness for a wedding reception, was a suitably relaxing environment for plenty of healthy discussion.

Steve Mitchell (Environmental Resources Management - ERM) chaired the afternoon session which started with **David Waddington** (University of Salford) presenting his paper jointly written with Jenna

Condie, Nathan Whittle, Phil Brown, Andy Moorehouse, and Mags Adams on *An investigation of human response to vibration in residential environments*. David explained the overall objective of this three-year Defra research study was to derive exposure-response relationships for the human perception of vibration in residential environments. He explained how great care had been used in planning the study, and gave some of the initial results. David was keen to explain the importance of designing the study around rigorously planned social survey work that would be essential to its success.

Next, the audience had the pleasure of hearing **Geoff Leventhall** speak on a completed Defra research contract *Coping with low frequency noise*. The paper was jointly authored by Donald Robertson, Steve Benton and Lyn Leventhall. Geoff started by reminding us that there is no low frequency cut-off point to human hearing, for example, at 20Hz mostly we hear at about 80dB less sensitively than at 1kHz. The study had delved into the personalities of low frequency noise sufferers, and found a tendency for them to be introverted types. The project had been aimed at developing a tool to help sufferers for whom we acousticians may have no technical solutions. The *Coping with Noise* workbook tool is available on CD, paper copy and on-line. Cognitive Behavioural Therapy can help sufferers to cope with low frequency noise, through managing or even overcoming the stress and symptoms.

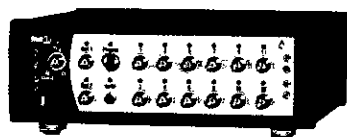
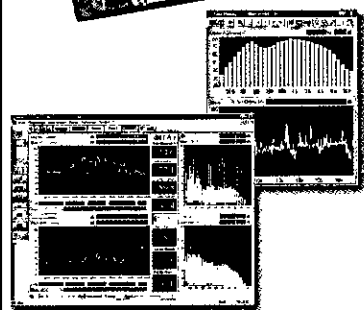
After coffee, Steve Mitchell introduced the workshop session and **David Trevor-Jones** (Vanguardia Consulting) gave a talk entitled *What noise, whose response?* to stimulate debate. David's talk had been trialled at a London branch evening meeting and with no slides or firm script, his free-flowing style was quite a change for most delegates, as was the subject matter.

continued on page 18

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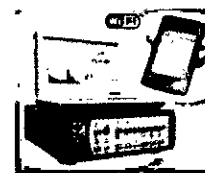
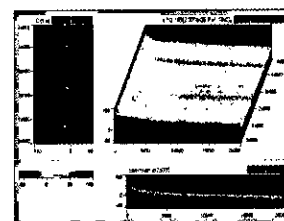
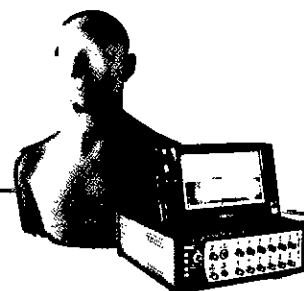


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Noise & Vibration Innovation

IOA Spring Conference - continued from page 17

David was interested in the type of sound we hear, and how as noise assessors we dealt with it. He took the audience away to an idyllic hotel next to a peaceful beach with the sound of waves lapping gently on the sand. A tap is dripping in a hotel room. The sound level of the dripping tap is almost unmeasurable, but it is impossible to sleep through it! Surely we hear, we listen, we learn, we adjust, and we respond. Maybe there is more to dose response than just noise level. David talked about some of the other factors that affect how we respond to a sound: eg fear, preventability, and information content, as well as the context and characteristics of the sound itself.

Of course this led us neatly to the topic of Soundscapes, the subject of several papers for the following day.

David suggested that much of WHO and other guidance is entirely about 'noise' and not sound. There is a problem when we confuse the two. As good acousticians we should avoid doing so, and in this regard acousticians have been overtaken by policy makers!

There was a lively discussion session about the topics raised by David besides those arising earlier during the day. There was a feeling we should always be aware of the 'error bars' around whatever dose response we are using, and we should resist the pressures to reduce our assessment to a simple report of whether or not the noise is 'above the limit'.

There was a great deal of discussion about soundscapes and 'positive noise'. Ines Kargel and Fabian Neuhaus, from Sonic Atelier, were keen to contribute some of their work on urban soundscape design in Austria. The chairman thanked them for their contribution to the discussion and offered to publicise their web site for further reading (www.sonicatelier.net).

Returning to fixed limits in guidance, a delegate asked if the WHO night noise guidance gave 30dB as a zero-effect response limit, was there any other environmental issue where we demanded absolutely no observable effect? One delegate suggested that perhaps the setting of safe limits for poisonous substances was one, but even in that case there was an element of pragmatism as to what was achievable. The mood of the conference was clear: it was that the WHO guidance, including the upcoming night noise guidance, was of great interest to acousticians in understanding about the onset of health effects, but it was quite wrong to draw any form of practical 'limit' from 'zero effect' onset values.

The Institute would particularly like to thank David Trevor-Jones for his contribution to the workshop and helping to stimulate such a thought-provoking discussion.

At 5pm the Environmental Noise group AGM was attended by 27 delegates. In keeping with tradition, this was a rapid affair. The meeting was closed by Steve Mitchell, the new committee chairman, after Steve Turner has expressed a big 'thank you' to Ken Collins for his work and efforts as chairman of the ENG over the last few years.

Conference dinner

The conference dinner followed a drinks reception in the marquee - contrasting with the similar marquee at our usual Oxford venue, in that road traffic noise from the M45 was barely audible - and was held in the ballroom in the original Dunchurch Hall. The catering was of a very high standard, and as is traditional, presentations were made to worthy award recipients as after-dinner entertainment. These were just two in number: Mark Tatham, a former President of the Institute of Acoustics, was presented with an Honorary Fellowship by the current President, John Hinton, and Tony Clayton received from Ed Clarke, chairman of the Association of Noise Consultants, his prize for the best Diploma project of the year (2008 diet).

Most delegates then adjourned to the bar or the games room, where the principal conflicting attractions appeared to be virtual tennis doubles (or was it squash? We never found out!) on a Wii and a big screen, and the draught Wells Bombardier kept to an excellent standard by the Polish barman. The real beer is a compelling reason to return to the venue for future conferences!



Former Presidents are usually easy to spot at Conferences



Drinks reception in the designated 'quiet area' that was the marquee



Drinks reception before dinner



Conference dinner in the Hall



Conference dinner in the Hall



The nuts holding the chandeliers remained intact

Wednesday 29 April

The Wednesday morning session, chaired by Nigel Cogger (the English Cogger Partnership) concentrated on the European Noise Directive (END), and opened with a paper by **Mary Stevens** (Environmental Protection UK - EPUK) on *Reducing transportation noise at source - influencing EU regulations on tyres*, one of the aspects of environmental noise being driven by the END. The paper outlined the influence that EPUK has had on tyre approval standards, emphasising the dual environmental benefits that good tyre design could have on fuel consumption and noise levels. The importance of clear labelling to enable effective consumer choice was emphasised -labelling can at present refer to 'quiet' tyres without any objective information. Labelling to provide information on noise, emissions and wet grip is to be required from 2012, but there is currently a lack of detailed information, so EPUK is to maintain its pressure on the EU and promote suitable content. In practice tyre noise is dominant at speeds above 40kmh-1 so the impact of reductions in tyre noise in cities and agglomerations - the target of the END - will be limited. However, Mary emphasised that raising awareness of tyre noise issues was one part in the overall strategy on controlling noise and other adverse environmental impacts from transportation sources.

Nigel Jones (Extrium) then opened the series of presentations on the END itself, with an introduction to the definition of the terms used in the Directive. Options are available for the definition of agglomerations affected by the major noise sources and there is no common definition of the types of areas that may be included, such as the more general terms 'urban' and 'suburb' as well as specific administrative areas (wards, council boundaries, planning policy boundaries etc). Whilst terms like 'major road', 'railway', and 'industry' may seem simple to identify, classifications of roads, railways and types of industrial sites across Europe are by no means consistent and hence the noise data generated will also be inconsistent. Although minimum numbers of vehicle passages per year have been set for road and rail links to be identified, Nigel showed that this could lead to anomalies where part of a major road or rail link had intermediate sections where the number of vehicle movements fell below the threshold. There are also several options available to member states when implementing the END, including calculation methodologies, the software implementation used and the level of data to be incorporated in the model. The options in both permissible definitions and implementation strategies will clearly influence the outcomes and any ability to compare directly the various results from each member state of the implementation of the Directive.

Yvette Bosworth (Defra) followed this presentation with an update on the *Implementation of the the END in England*, which is being undertaken by Bureau Veritas and Extrium, under the overall direction of Defra. Yvette outlined the progress made since 2007, one aspect of

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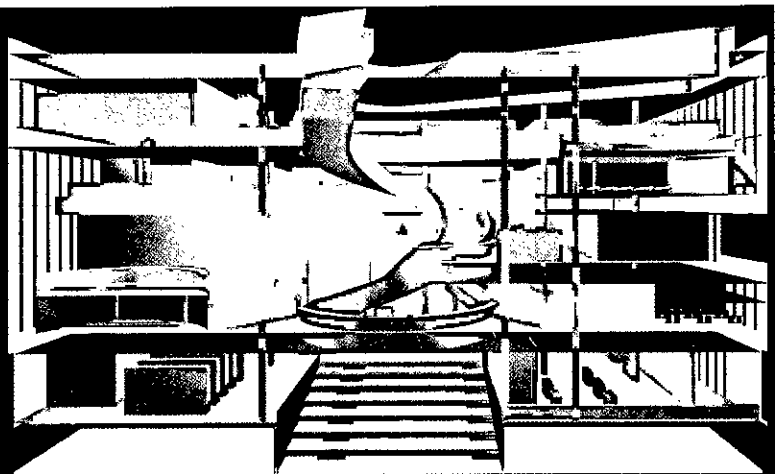


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IOA Spring Conference - continued from page 19

which was the 'data flow' (DF) reporting to the EC and European Environment Agency. Strategic noise maps have been prepared for twenty-three agglomerations and fifteen civil airports, plus major roads and railways, with the information available on the Defra Noise Mapping England (NME) web site. Guidance for airport operators on producing noise action plans, and current thinking on draft template action plans, has been published. Stakeholder workshops are to be held through the summer of 2009 to enable action plans to be developed and adopted by January 2010. The second round of noise mapping will run in parallel with this process, extending the areas mapped to a further 65 agglomerations of more than 100,000 inhabitants, and half the vehicle movements on roads and train movements on railways. During the discussions it was admitted that the methodology for implementation of action plans is, as yet, unknown, and that inconsistency in mapping techniques can lead to significant differences in the noise maps and therefore the action plans. It was emphasised that the noise maps were a tool to determine whether action was needed and approximations are, therefore, acceptable. The validity of 'league tables' across Europe was questioned.

After the coffee break, **Steve Turner** (Bureau Veritas) gave a review of the *Possible approaches to the identification of important areas for noise action planning in England*, based on the premise that the measures taken to reduce noise exposure cannot be isolated from the cost of those measures, or, indeed, the potential conflicts with other environmental goals and the impact on society. Steve proposed that the basis for action plans should be to 'promote good health and a quality of life through the management of noise within the context of sustainable development'. He then reviewed the indicators used to define the various transportation and industrial sources and their implications on developing objective criteria for noise action plans. He concluded that a threshold approach could be adopted, whereby action to reduce noise would be undertaken where the 1% of the population affected by the highest levels of transportation or industrial were located (as derived from noise mapping) and an appropriate threshold value was exceeded. In the discussion, Bernard Berry argued that having three different indicators for the various types of transportation noise would be difficult to put across to the public, that the values did not properly reflect community response, and that the values could be considered high. Steve Turner responded that the indicators should not be considered as static criteria, but as a starting point for assessing the cost and practicability of carrying out action plans. Colin English emphasised that any action plan should provide a meaningful improvement to people's lives.

The final paper on the English response to the END was a presentation by **Colin Grimwood** (Bureau Veritas) on *Possible approaches to the protection of quiet areas*. At present this is limited to quiet areas in agglomerations, although a proposed amendment to the Environmental Noise (England) Regulations seeks to widen the scope of the 2006 regulations. The primary action is obviously to identify quiet areas and, while there is no responsibility for local authorities in this, the Defra research undertaken by TRL proposes that an initial filter based on a noise level and minimum area should be extended to include the views of stakeholders, the involvement of local authorities and areas where the noise level is 'worthy of preservation'. Colin proposed that PPG17 could be revised to provide guidance on quiet areas, including an additional policy designation, as well as identifying noise levels and soundscape in the qualitative information for an audit of the space.

Finally, it was the turn of Scotland to show how it is taking forward Action Plans in a paper prepared by David Wallace (head of air, noise and nuisance in the Scottish Government) and presented by **Bernadette McKell** (Faber Maunsell). The Scottish team has developed maps for the agglomerations of Glasgow and Edinburgh and the airports serving those two cities and at Aberdeen. A series of workshops was then held to discuss the approach to action planning, with support from the Scottish Government and key partners (the

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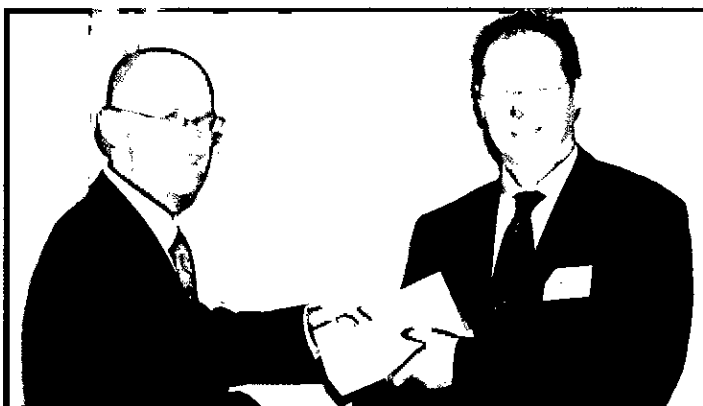
John Hinton reads the citation for Mark Tatham's HonFIOA award



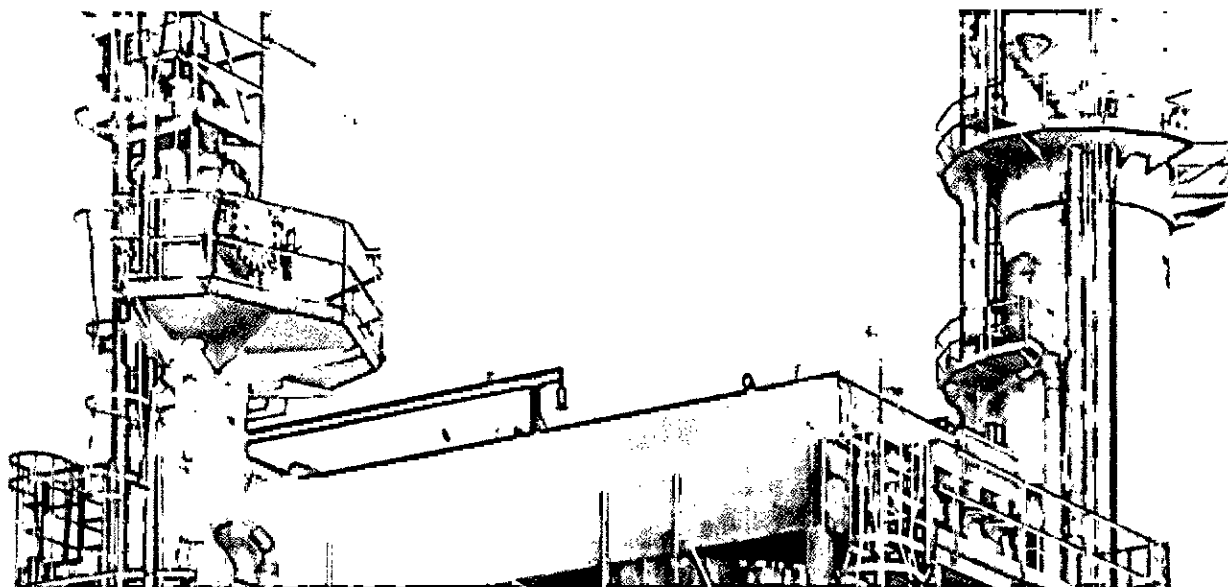
Mark Tatham receives an HonFIOA from the President



Mark expresses his gratitude



Ed Clarke presents Tony Clayton with his ANC Prize



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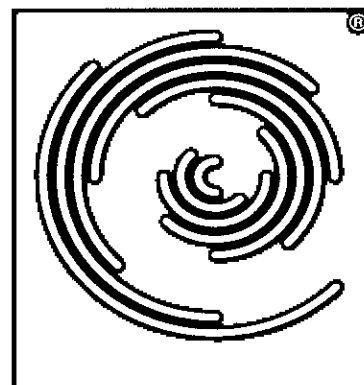
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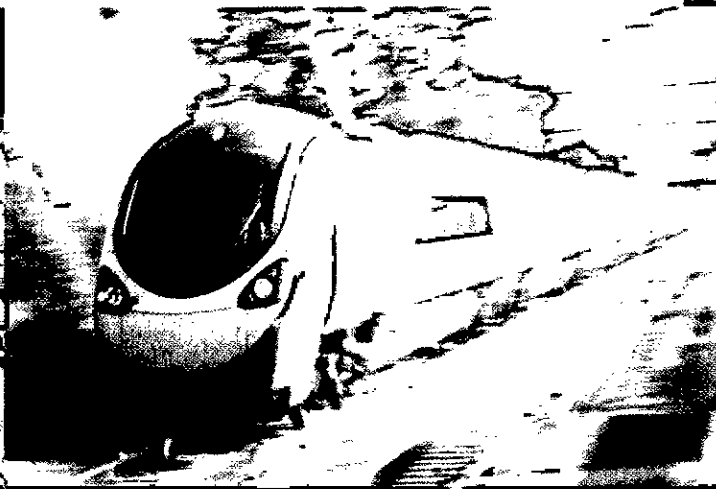
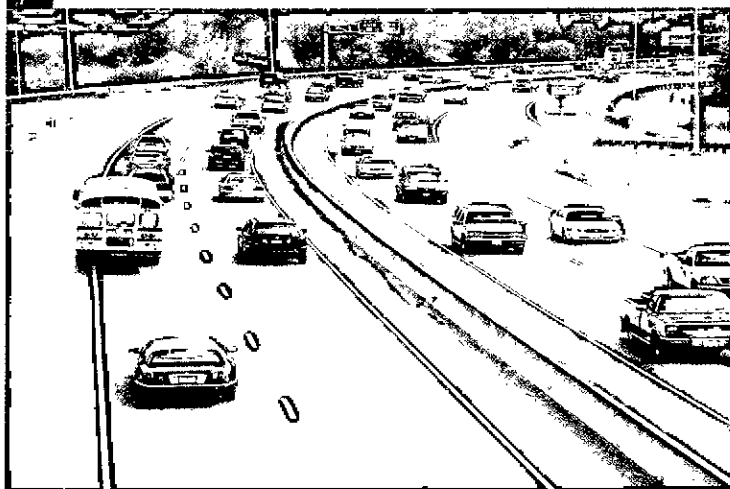
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IOA Spring Conference - continued from page 20

transport bodies, local authorities and SEPA), followed by the setting up of working groups involving representatives from relevant bodies. Candidate Noise Management Areas (CNMAs) were identified and prioritised on the basis of noise levels, the number of receptors and the annoyance response. Twenty-five CNMAs have been identified (six affected by rail noise and nineteen by road noise), which are to undergo a 'reality check' prior to confirmation of the final NMAs and implementation of action plans, as required, following a period for public consultation and a cost-benefit analysis. The team is also identifying candidate quiet areas based on established parks, SSSIs etc and application of the TRL criteria. Quiet areas are then to be subject to a consultation process to determine the action to be taken to preserve those areas. A research study on road noise abatement measures is near completion and a review of PAN56 is underway to take account of the Environmental Noise Directive.

Following the lunch interval, Stephen Turner took over the chair for a session on soundscapes. First, **Peter Rogers** (Cole Jarman) described *Environmental soundscapes and wellbeing within a sustainable society*.

Next, **Bill Davies** (Salford University) presented his review of the state of the art in *Soundscape perception and assessment*. He began by defining soundscapes as the accumulation of all sounds within a location with an emphasis on the relationship between individuals, or society's, perception, understanding, action and interaction with the sonic environment. Soundscapes affect health and well-being, behaviour and quality of life, and the concept may prove to be a better 'fit' with human response than just noise control. Bill outlined the scope of the Defra project and the literature review his team had completed, and went on to make some remarks about how a soundscape might be 'designed' by practitioners, how it might be modelled, and how deliberate interventions might be assessed. The question as to whether aesthetics were a matter only for artists was also considered.

Jian Kang (University of Sheffield) offered a *Design framework and an ANN model for soundscapes in urban open spaces*. This confirmed the usefulness of artificial neural networks (ANNs) in the classification of urban open spaces. Further improvements could be achieved by the establishment of a more complex model structure, with sub-models including the evaluation of background sound level, sound preference (noticed, or 'foreground' sounds), and other physical factors such as satisfaction of thermal comfort, lighting issues, and view.

Steve Blake (City of London) and **Ruth Calderwood** (Bureau Veritas) explored the *Development of the concept of quiet zones within the City of London*. The City is home to 8000 residents and the 'square mile', accommodating some 350,000 office workers and tourists every day. The aim of the strategy on quiet areas was to find methods by which implementing quiet zones and improving the overall landscape could be a part of the provision of areas of rest, recuperation, relaxation and contemplation for all City users. Short-term attended noise surveys were undertaken in green spaces and other areas expected to be 'quiet' in order to provide a tool for the development of further studies, as well as information on noise types and levels experienced in quiet areas.

Paul Shields (Scott Wilson) brought proceedings to a close with a paper on the *Westminster open space study*.

Feedback on the conference was positive, with delegates enjoying the new venue and finding the technical programme stimulating. A number of suggestions were offered for improving future events that IOA headquarters and the ENG committee have noted with interest.

At the end of the day a special presentation was made to Colin Grimwood for his behind-the-scenes efforts in pulling the technical programme together. We should all remember that these events only happen when members of the Institute and its various committees go that extra mile, and we all need to do our bit. Please help support the voluntary efforts made by your national committee and local branch representatives.



With exercise session - not compulsory!



Brüel & Kjær's exhibition stand



Morning coffee presents the usual opportunities for networking



Acoustical was an exhibitor



Casella CEL showed a wide range of products



The purpose-built conference centre



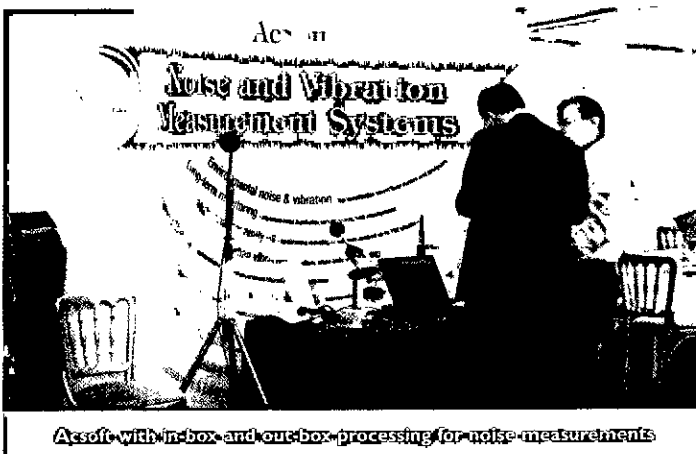
Campbell Associates demonstrated instrumentation and software



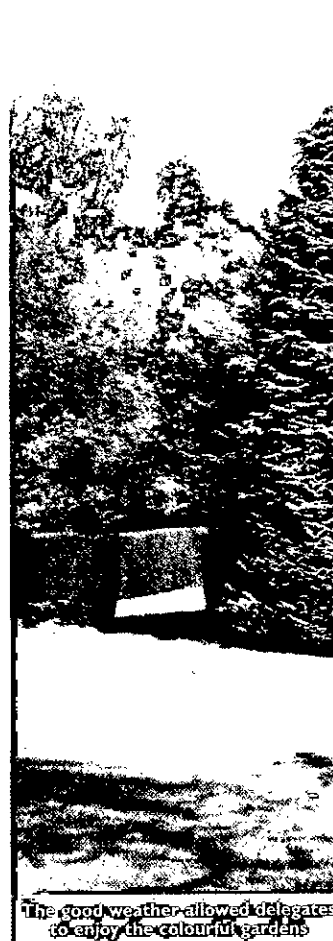
Further discussions outside - if time!



ANV Measurement Systems had a full range of Rion equipment to try out



Acsoft with in-box and out-box processing for noise measurements



The good weather allowed delegates to enjoy the colourful gardens



Well, I think it's a rabbit!

Consultation on proposed amendments to the Environmental Noise (England) Regulations 2006

John Hinton. Response from the Institute of Acoustics

Introduction

In February 2009 Defra published a consultation document proposing minor amendments to the Environmental Noise (England) Regulations 2006. The IOA's response was prepared by the Environmental Noise Group, and is reproduced below.

The Environmental Noise Directive (END) introduces a new regime of strategic noise mapping and subsequent action planning for major roads, railways, airports and agglomerations in all member states. The END was transposed into English law by the Environmental Noise (England) Regulations 2006 and recent minor amendments were made by the Environmental Noise (England) (Amendment) Regulations 2008. The consultation proposes further amendments to the Regulations and seeks views on the proposed amendments.

The amendments proposed address the delays in implementing the Directive and aim to streamline the procedures for the implementation. The noise mapping process and results suggested to Defra that a change in approach in certain areas of the implementation of the END would lead to a more efficient and beneficial action planning process. The consultation indicates that proposed amendments would come into force in mid-2009.

The IOA's response to this consultation ensures we remain engaged in government policy on environmental noise, mapping and action planning.

Defra is planning to formally launch its consultation on Action Plans this summer, and the Environmental Noise Group plans to run workshops for members interested in contributing to the IOA's response.

1. Amendment to Regulation 13 (Identification of quiet areas)

Question 1 - Do you agree with the proposed amendment to Regulation 13 regarding the identification of quiet areas?

The Institute of Acoustics is pleased to note from the discussion in the consultation document with regard to this amendment that Defra recognises that local knowledge of potential quiet areas should play a role in the final determination. This is one of the essential roles for local authorities, and their citizens, in the effective delivery of the noise action planning process. The IOA also notes that Defra believes the more logical way forward is to ensure that quiet areas are identified as an integral part of action planning. The IOA would also note that the outputs of noise mapping will provide an important dataset to help Local Authorities identify *potential* quiet areas. They should also assist the identification and prioritisation of areas exposed to high noise levels from a combination of sources.

Provided that Defra includes a commitment to this effect in the context of finalisation of the agglomeration noise action planning template, then the IOA can see no objection to the proposed amendment.

2. Amendment to Regulation 14(2) (production of consolidated noise maps)

Question 2 - Do you agree with the proposal to revoke the duty as regards consolidated noise maps in Regulation 14(2) and to replace this with a power on the Secretary of State to produce consolidated noise maps in respect of any area?

The IOA is aware of the technical challenges in consolidating noise maps, but we feel that consolidated noise maps have value in conveying meaningful information to the public and, within agglomerations, in identifying potential quiet areas.

3. Amendment to Regulations 14(1) and 30 (guidance)

Question 3 - Do you agree with the proposal to revoke the specific duty on the Secretary of State to publish in Regulation 14(1) and to replace this with a general power to publish guidance?

The IOA agrees that this will give greater flexibility to support the action planning process. It also acknowledges that this would give rise to the interesting situation where the Secretary of State (SoS) is writing guidance to himself in his role as the competent authority. However, in the interests of transparency, it would seem appropriate that the general public have access to the information that the SoS has had regard to, so we trust the SoS will continue to publish guidance as necessary.

Question 4 - Are there any other comments relating to the proposed amendments that you would like to make?

Our comments with respect to Q1 have been made whilst acknowledging that there may be many small but highly valuable local quiet amenity sites within or adjacent to agglomerations which do not meet the land area criteria within the report *Research into Quiet Areas: Recommendations for Identification*. We understand, from presentations at our Spring Conference on 28-29 April, that Defra is considering reducing the minimum area, which we support.

More generally, the Institute welcomes the more flexible approach being advocated by Defra and we look forward to providing detailed comments on the noise action planning templates for agglomerations, major roads and major railways in due course.

Furthermore, we look forward to playing a significant part in the consultation on these action planning templates and to assist Defra in obtaining views from our members, for example by running workshops after the consultation is launched.

John Hinton OBE FIOA

President of the Institute of Acoustics

Meeting Report

Richard Collman. Central Branch - What dose? Whose response?

On April Fools' Day, Central branch members met at their usual venue, NHBC in Milton Keynes, to listen to David Trevor-Jones' informative and provocative polemic (his term) about the appropriateness or otherwise of some ubiquitous acoustic criteria. He had previously presented this topic (*What dose? Whose response?*) to the London branch and has subsequently done so at the Spring Conference.

Some of David's insights were obvious when put into words, but, like many of the best ideas, tended to be overlooked. For example, the guidance that 30dB(A) is appropriate for bedrooms ignores the way in which a highly annoying (but very quiet) dripping tap can prevent sleep. Conversely, the sound of waves breaking on a beach can be very relaxing or soporific, even though their level is much greater than 30dB(A). David brought these two extremes

together very effectively by considering an exclusive hotel room on a remote desert island.

This very brief review can only highlight a couple of the many significant points that David raised, in his usual entertaining and thoughtful style, bringing a very different perspective to several 'rules' that are often taken for granted. The discussion concluded with the heretical suggestion that acousticians should consider explaining what sound is like, by using descriptive terms that could actually mean something to a layman, rather than stating levels in such 'useful' parameters as $L_{Aeq,5min}$, or $L_{A90,1hr}$ (for example).

The general consensus was that David had earned his dinner at the (relatively) nearby Indian restaurant, to where the Central branch meetings are habitually adjourned for further discussion.

Plaster Smooth Acoustic Finish for Woking Gallery



The
Lightbox

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Conference preview

Euronoise to look at the effect of noise on health

The UK's biggest conference for a number of years to be held on tackling noise issues takes place in the autumn and some of the major players in the acoustics world will be gathering for Europe's premier event in 2009.

Euronoise 2009 - Action on noise, taking place from 26 to 28 October in Edinburgh, will see leading authorities from acoustics from all around the world attending the three-day conference to discuss various topics.

The event, organised by the Institute of Acoustics in conjunction with the European Acoustics Association, is being held in Scotland for the first time. One of the hot topics under discussion will be the effects of noise on health as part of Professor Stephen Stansfeld's plenary lecture.

UK-based Prof Stansfeld will provide an overview of the new challenges and opportunities in this field. He will also outline how the setting up of a new European Research Network on Noise and Health will facilitate these developments and draw new research into the field from other relevant disciplines. An important function of the new network will be to encourage the training of young researchers in noise and health research.

As well as Prof Stansfeld's, the other plenary lectures are: *Adventures in active control*, by Colin Hansen from Australia, and in keeping with the international flavour of the conference, Dick Botteldooren and Timothy Van Renterghem from Belgium will discuss *Modelling outdoor sound propagation*.

In addition to this there will be 500 shorter presentations arranged in ten parallel sessions over an intense three-day scientific exchange. There will also be workshops and poster presentations.

The event will also cover new research findings on issues such as:

- The influence of aircraft noise on hypertension
- The long-term effects of aircraft noise exposure on children's cognition, with findings from the UK RANCH follow-up study
- Effects of long-term road traffic noise exposure on sleep

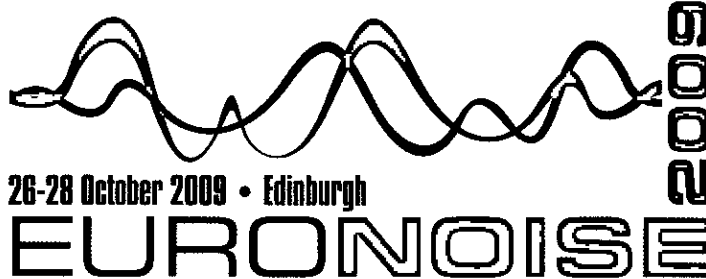
The conference package will include a mixture of business and social events with a drinks reception after the opening ceremony, and a reception with traditional Ceilidh music. A conference dinner will be held at Murrayfield, the home of Scottish rugby.

Technical visits will also be arranged for some of the delegates on a first come, first served basis, with the BBC Studios and Edinburgh Airport being considered as likely attractions.

Anyone wanting to attend Euronoise can now register through the Euronoise conference website www.euronoise2009.org.uk. The site also includes information on fees, how to get to Edinburgh, business and social activities.



Noise dosimeter



Sponsorship

There are still a few sponsorship options available. The three levels are gold, silver and bronze, all at different rates and offering different opportunities.

There are expected to be around a thousand delegates at the exhibition ensuring many opportunities for getting exposure for companies, not only during the days of the conference, but also in the period leading up to it.

Some of the companies who have already booked sponsorship packages are: Brüel & Kjær, Casella, Cirrus Research, Ecophon, ESI Group, Odeon and AECOM.

Coverage for sponsors will include the company's name and logo appearing on Institute websites, *Acoustics Bulletin*, and at Institute meetings and conferences.

Please refer to the Euronoise website for the full list of benefits: www.euronoise2009.org.uk.

Contact Kevin Macan-Lind, at kevin.macan-lind@ioa.org.uk, telephone +44(0) 1727 848195 to discuss the options available.

About Edinburgh

Edinburgh is the second largest city in Scotland and the seventh largest in the United Kingdom. The city has many cultural attractions, festivals, Edinburgh Castle, museums and Edinburgh Zoo. The city also has a lively nightlife, shopping, music, theatre and film events. Edinburgh is well-known for the annual Edinburgh Festival, a collection of official and independent festivals held annually over about four weeks from early August.

The number of visitors attracted by the Festival is roughly equal to the settled population of the city. The best known events are the Edinburgh Fringe (the largest performing arts festival in the world), the Edinburgh Comedy Festival (the largest comedy festival in the world), the Edinburgh International Festival, the Edinburgh Military Tattoo, and the Edinburgh International Book Festival. There are also many attractive places nearby to visit including the highlands. There is more information at www.visitscotland.com

Some places of interest in and round Edinburgh:

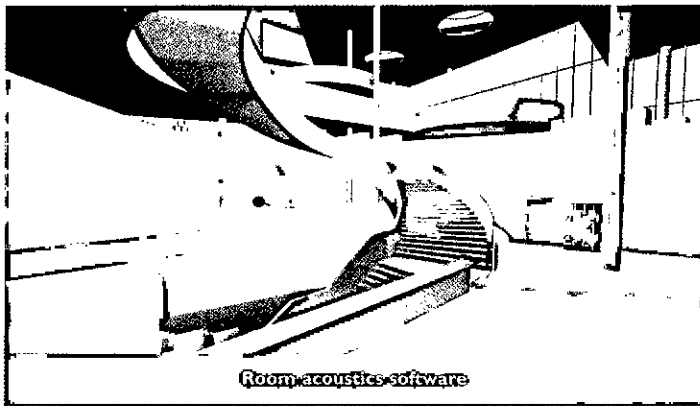
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| • Edinburgh Castle | • Scotch Whisky Heritage Centre |
| • Arthur's Seat | • Scottish Parliament |
| • Edinburgh Dungeon | • Dynamic Earth Centre |
| • St Giles' Cathedral | • Mark King's Close |
| • Museum of Childhood | • Palace of Holyrood |
| • National Gallery of Scotland | • Nelson's Column |
| • Scottish National Portrait Gallery | • Royal Observatory |
| • Scott Monument | • Craigmillar Castle |
| • Royal Museum | • Edinburgh Zoo |

Sponsors of the event

AECOM

AECOM (formerly Faber Maunsell) is delighted to be sponsoring Euronoise. We are also fielding a team of noise professionals from across the UK who will be presenting, and also chairing sessions. TEAM AECOM will comprise of, Dr Bernadette McKell, Dr David Palmer, Dani Fiumicelli, Gil van Buuren, Mathew Harrison and Jon Wilmot.

Bernadette will be chairing sessions on noise mapping in Scotland and acoustics in Scotland and also co-presenting with Dani on sound evaluation and with Jon on building services issues. Gil will be presenting a paper on room acoustics and Matthew will take a global perspective on wind farm matters. David will be covering issues in relation to noise mapping. AECOM wishes the conference organisers and attendees every success and look forward to participating in what is sure to be an exciting and stimulating event.



Brüel & Kjær

Brüel & Kjær is proud to be a gold sponsor at this year's Eurnoise 2009 conference.

Come and meet their technical engineers as they exhibit Brüel & Kjær's sound and vibration equipment throughout the three-day event. Either drop by the stand or contact heather.wilkins@bksv.com if you would prefer to book a meeting beforehand.

Cirrus Research

Eurnoise 2009 will see the UK launch of a totally new range of sound level meters, analysers and environmental monitors from Cirrus Research plc. This brand new range utilises the very latest technology and techniques as well as incorporating some innovative features to make noise measurements as simple and worry free as possible, no matter what the application.

Our established range of sound level meters and accessories will also be on show, including major functional additions to the doseBadge personal noise dosimetry system and the recently introduced Sound Sign noise warning sign.

As well as the range of hand-held instrumentation, Cirrus will also be demonstrating the Noise-Hub noise monitoring system. This new system can incorporate fixed and portable noise monitors as well as data from external sources such as weather data and flight information.

Cirrus engineers will be on hand to demonstrate and discuss all the new product developments.

Odeon A/S

Odeon A/S is developing and distributing the room acoustics simulation software Odeon. The software has been developed since 1984 and is especially famous for its realistic auralisation and flexible user interface.

In June 2009 Odeon A/S released Version 10 with multiple improvements and new features: two of the most outstanding new features are the implementation of array loudspeakers and sound propagation around screens with one or two edges of diffraction.

At booth 8 the Odeon software will be demonstrated by the software developers. Spend five minutes to get from a raw dxf-file to a result you can listen to. Furthermore Dr Jens Holger Rindel will present a paper on how Odeon handles complicated geometries with a multipurpose school as case study.

Just after the Eurnoise conference Odeon A/S is giving a two-day course in advanced room acoustic modelling with Odeon 29-30 October 2009 Edinburgh. For more information visit www.odeon.dk

ESI

ESI, the leader in simulation-based design solutions, presents VA One, the ONE simulation environment for vibro-acoustic analysis and design. VA One offers the full spectrum of vibro-acoustic methods within one easy to use modelling environment. It delivers unprecedented modelling flexibility by coupling



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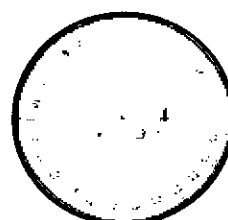
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continued on page 28

Conference preview - continued from page 27

Statistical Energy Analysis (SEA), Finite Element Analysis (FEA) and Boundary Elements (BEM). ESI is a Silver sponsor of Euronoise 2009 and will be demonstrating the latest advances in its hybrid and fast multipole BEM solutions during the event.

For more information about VA One or ESI, please visit us at booth 44 during Euronoise 2009 or contact us at:

Email: info@esi-group.com, telephone: +44 (0) 1865 784830, web: www.esi-group.com/vibro-acoustics

Saint-Gobain Ecophon

Saint-Gobain Ecophon is a leading, global supplier of sound absorbing ceilings and wall absorber systems. Saint-Gobain Ecophon Ltd in the UK is a sponsor member of the UK's Institute of Acoustics which is organising the event on behalf of the European Acoustics Association.

Ecophon is one of the Gold Sponsors for the conference and will sponsor the Chairman's reception and dinner, besides presenting four papers during the conference and taking an exhibition stand.

The four papers will support much of Ecophon's ongoing work around how sound affects people by promoting the benefits and consideration of Room Acoustic Comfort™ focusing on the interaction between person, room and activity.

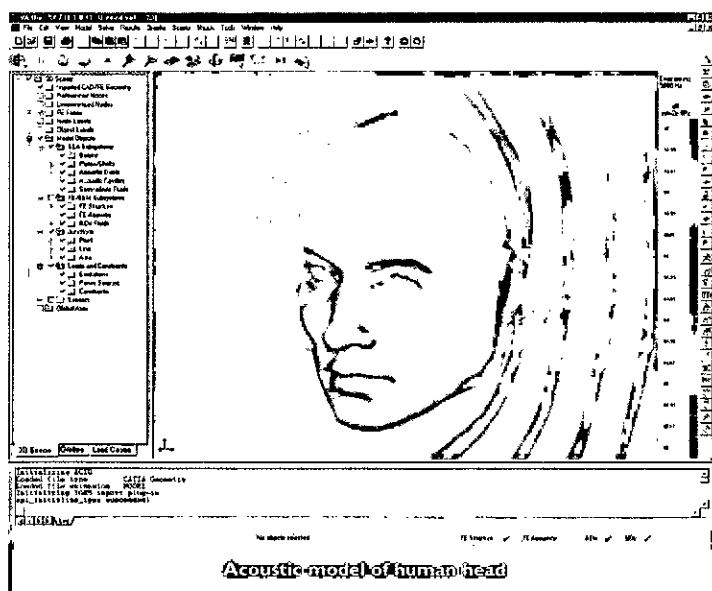
Our papers will cover a range of subjects: *Acoustics in office premises; Is it possible to create a good working environment in an open plan office? and Exploring acoustic parameters for open plan offices.* Acoustics in Healthcare will include *Room Acoustic Comfort™ in healthcare premises* and the Acoustics in Education session *Noise level reduction in secondary school classrooms by acoustic treatment.*

Casella CEL

Throughout its history Casella CEL has launched several blockbusting products, which, as many acoustics professionals will acknowledge, changed the way that noise measurements were made. The products included world firsts like the CEL-193 Type 1 L_{eq} sound level meter with 63 dB pulse range in 1979, the ground breaking CEL-393 in the early 1980's and the paradigm shifting CEL-593 DSP based real-time frequency analyser in 1993 - fully two years before one of our leading competitors!

The CEL-600 series builds on this pedigree in noise measurement offering digital stability and precision, colour display, intuitive user interface, ease of connectivity and upgradeability. New 'environmental' functionality has already been added since the initial launch in 2008 and more will follow soon.

Casella Insight, also new for 2009, is a software package which uniquely offers the ability to download and report data from Casella's range of noise (and dust) related products including the CEL-350 dBadge all-digital noise dosimeter.



IOA ANC / Consultancy Spotlight Contribution

Ed Clarke.

This month's report summarises the recent ANC meetings, including the AGM and associated festivities, with more information on the association's initiatives to combat certificate fraud.

ANC meeting report

The AGM and bi-monthly meeting were held at the RIBA headquarters in Portland Place, following the trend of recent years to try different venues for the annual meeting and dinner. In the 'current economic climate', however, it was felt that hiring a battleship could not be justified (last year's event having been aboard HMS Belfast).

Following an evacuation of the RIBA building allegedly caused by one of the ANC board members, the meetings eventually got under way amidst the usual ironic comments about the acoustics of rooms in which acousticians meet (in truth it was not really all that bad).

In the main company meeting we heard about encouraging progress from a working party being formed to look into available and emerging guidance on environmental noise measurement and assessment; Jo Miller described the work the membership steering committee is doing in support of newer consultancy practices; and we heard that the draft BB93 revision will go out for consultation shortly.

The technical forum addressed a couple of live contentious issues but is unminuted, so it would be inappropriate to go into the juicy details – ANC members need to attend the meetings to find out. Consultancy practices which are not yet ANC members need to get their application forms in!

We also explored the range of subjects in which ANC members would be interested in more support from the association, which are non-acoustical but relevant to consultancy – financial planning, IT outsourcing, business development and so on. There was a consensus view that a great deal of wheel re-invention could be avoided with a little more coordination and support, and this will provide a focus for discussion in future meetings.

The AGM business was then conducted in the usual, if somewhat formulaic manner, and centred around financial and strategic planning, with no board elections on this occasion.

ADvANCES in test certification

Following the difficulties reported earlier this year in relation to report and certificate falsification within the ANC's sound insulation test certification scheme, we can confirm that the association went 'live' with the new on-line system on 1 June.

The system is called ADvANCE – it being the ANC's verification system for Approved Document E (ADE), and because it represents a real step forward in this area. A simple process involves clicking through from the ANC main web site to ensure authenticity (www.theanc.co.uk) and entering a unique task number and password which is generated for each site. These details are found in the tester's report (a actual report still has to be issued, to comply with ISO140), or can be distributed directly by the tester to the client or Building Control, or both. It is made very clear, however, that the client's permission must be granted prior to release of such information to Building Control or, indeed, to any other third party.

The user is then presented with a list of all of the tests carried out under that task number, the performance values and a tick or cross to indicate whether it has achieved the ADE compliance standard (note that, of course, it is ultimately down to Building Control to confirm whether reasonable resistance to the passage of sound has been demonstrated).

We believe that this system eliminates the possibility of repeats of the type of fraud uncovered recently, and have worked hard to ensure that it is as secure as possible from any more sophisticated online fraud.

The secretariat would welcome any feedback on the system from users or interested observers alike – please contact ANC at www.theanc.co.uk.

ADVANCE

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Meeting report

North-west branch

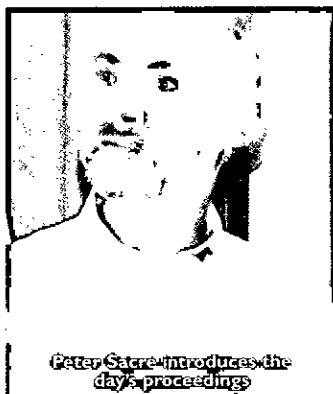
A one-day meeting on *Latest developments in transportation noise and action planning* was held on Thursday 21 May 2009 in the Clifford Whitworth Conference Centre at the University of Salford. This venue came complete with good facilities, parkland outside, free parking nearby, a bespoke railway station and a world-class acoustics laboratory across the way.

The morning session, chaired by Peter Sacre of Acoustic and Engineering Consultants Ltd, our famous branch chairman, started with an overview by **Stephen Turner**. Stephen, Director of Acoustics with Bureau Veritas, gave the current position regarding implementing the EU Noise Directive. This requires reporting back on progress to Europe using its Dataflow system. Dataflow 4, on noise maps, was required by December 2007, and Dataflow 5, on major roads, railways, airports and agglomerations, by December 2008. Dataflow 6, noise control programmes, and Dataflow 7, action plans, were required by January 2009. Stephen's impression was that although the reporting was not as quick as he would like, the UK was doing better than most countries and was securing admiration from EU colleagues. Stephen gave more details on the UK position, with a note of caution about the use of data now available, particularly with regard to the need to compare like with like and to understand what was actually evaluated. It became clear that there was an inherent risk in comparing different countries' findings with each other.

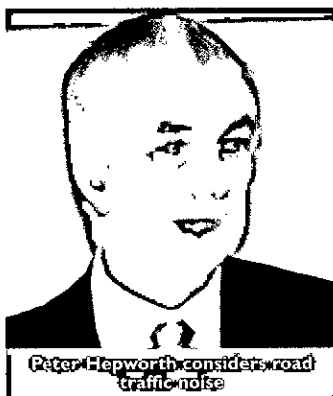
Peter Hepworth, founder of Hepworth Acoustics Ltd, then gave an *Update on road traffic noise*. His experience of 35 years of traffic noise assessments led from the 1973 Noise Insulation Regulations through planning assessments and on to noise mapping and the WG-AEN (European Working Group - Assessment of Exposure to Noise) accuracy study of calculation methods such as CRTN (*Calculation of road traffic noise*). During that time CRTN had itself started in 1973, and had been revised in 1975 and 1988. The *Manual of environmental assessment* had appeared in 1983, volume 11 of the *Design manual for roads and bridges* in 1993, *A new approach to appraisal* in 1998, *WEBTAG (Transport analysis guidance web site)* in 2003 and a revised volume 11 in 2008. Peter provided succinct information on road noise assessment progress and land use planning, highlighting improvements such as WEBTAG allowing for the economic assessment of transport scheme alternatives, calculation improvements and the role of computers in coping with large areas and data for noise mapping.



Stephen Turner gives the lowdown on the EU Noise Directive



Peter Sacre introduces the day's proceedings



Peter Hepworth considers road traffic noise

Coffee was followed by **Dr Rick Jones** of DeltaRail with his *Update on railway noise* including EC legislative initiatives, ISO/CEN standards and current trends in noise control. The EC has Technical Specifications for Interoperability, known as TSIs. These define noise limits for new coaches, locomotives, multiple units and new or upgraded freight wagons. Limits use the pass-by level L_{pAeqTp} , the stationary level L_{pAeqT} , and where appropriate the accelerating level L_{pAmax} . TSIs also specify cab noise levels using maximum speed levels and the noise from the external warning horn whilst stationary, these being the major contributors to journey noise level averages. The EC is pressing for a progressive reduction in specified levels. The UK has a disadvantage that its structure gauge is smaller than that of mainland Europe. This reduces the cross-sectional area of vehicles so there is less room for noise reduction equipment such as silencers. On the other hand, an early decision to adopt disc brakes instead of the noisier tread brakes gives the UK an advantage, as the majority of European freight traffic has tread brakes. Rick's prediction of the future brings improved railway noise barriers, wheel tuned absorbers, optimised wheel shapes and rail tuned absorbers. Traction noise reduction will include better air management control, better aerodynamics, diesel engine silencing, the isolation of electrical equipment from radiating structures, and low gear noise design. Nevertheless, the main determining factor for quiet rail traffic remains smooth wheels running on smooth tracks.

Mike Swanwick of Rolls Royce plc then finished the morning with an *Aircraft noise update*. Since 1955 there has been a significant reduction in aircraft noise of around 20dB. Unfortunately it gets harder and harder to reduce noise and an aim to reduce new aircraft levels by a further 20dB could be described as quite a 'racy' target. In noise reduction terms 0.1dB is a significant achievement on a modern jet, but the improvements do add up. Noise sources on a modern aircraft include jet mixing noise, fan, turbine and combustor noise, airframe noise, and fan and compressor noise. Mike illustrated these sources and showed how their levels varied with what the aircraft was doing. For example, on take-off, aft fan and jet noise dominated, whilst on landing, the inlet fan and compressor were loudest, followed by the aft fan and airframe noise. For 2010 the Vision 10 targets included technologies to improve nozzle and fan designs and refinements to existing architectures. Vision 20 targets for 2020 would need further technological steps, novel architectures and advanced operational procedures.

By the afternoon the rain had been supplanted by bright sunshine, and Paul Freeborn of Bureau Veritas and Organiser-in-Chief of the meeting had the chair. The first of the shorter afternoon presentations was on *Road noise action planning*, given by **Pam Lowery** of the Highways Agency. This has been the executive agency for the Department of Transport since 1994 and is responsible for operating and managing 7000km of motorway and trunk roads in England. Pam explained that the current approach to new and improved roads was to reduce and eliminate where possible adverse noise impacts through the EIA (Environmental Impact Assessment) process. The Noise Insulation Regulations are also applied as a matter of course, and there is a policy of using quieter road surfaces. These quieter surfaces are also used for major maintenance works on existing roads. In addition they have a 'Hansard policy' (the name deriving from criteria published in the Parliamentary Report from 22 March 1999) to address sites with a history of noise complaints. The future approach will be directed by END mapping and action planning. There is to be close working with Defra on a 'route map' approach and with local authorities. Quiet surfaces and Hansard policy will continue. Much will depend on them obtaining the required funding. There is to be a strategic business plan for the agency, and a revision of their environmental strategy. Pam also advised that it was likely that CRTN will be updated, possibly towards the end of the year or by spring 2010.

Andrew Jellyman of Birmingham City Council then spoke on *Draft local noise action plans*. The Birmingham Updated noise Mapping Project (BUMP) is based on a 1997 project and is overseen by a steering group. Its maps were completed by the end of 2007 and the steering group became the action development group in January 2008. These groups included major city council departments with representatives from DfT and Defra. Andrew confirmed that BUMP had provided a very powerful tool for developing city-wide action plans to deal with both

immediate and future noise. BUMP maps were a basis for developing local action plans with the first element since then being to target the people exposed to the top 1% of traffic noise. Motorways and quiet areas were also to be looked into. Andrew summarised the survey methods used and their findings, and how these were now being incorporated into the local action plans. Quiet areas were being considered using TRL criteria, as well as a possible option for night-time speed reduction on the M6 to reduce noise.

After the break **Dr Rick Jones** gave a presentation on *Railway noise action planning*. This started with the Environmental Noise Regulations and rail noise mapping, which were fundamentally similar for England, Scotland, Northern Ireland and Wales. The action planning philosophies of these regions, however, were all different, there being a different Competent Authority in each case. These were the Welsh Assembly, the Northern Ireland Transport Holding Company, Scottish Ministers, and the Secretary of State (Defra) for England. In addition England, Scotland and Wales all required engagement and commitment from relevant railway authorities. Given that the privatisation of British Rail had created around 90 different companies it was not obvious which organisations were 'relevant' in this context. However a meeting is planned with the aim of providing a coherent interface between the rail industry and competent authorities, and this may include the DfT, the Office of Rail Regulation, Network Rail, the Rail Safety and Standards Board, London Underground, DB Schenker (formerly EWS) and the

Association of Train Operating Companies.

Rick was followed by **Ben Hanley** of Birmingham Airport, who described *Airport noise action planning*. Birmingham airport is about the sixth largest in the UK, with around 10 million passengers a year. It is also located close to residential areas, with its air movements and noise levels making a noise action plan essential. Ben described its environmental and community management methods, and the potential communication challenges of describing L_{den} and L_{Aeq} noise contours, together with what was being done to minimise noise. The action plan development has a time line from March 2009 until January 2010. Its stages include the guidance launch, engagement with the airport consultative committee, airlines, air traffic control (NATS) and local authorities, then the development of a draft noise action plan. This goes out to public consultation, is reviewed, and then goes for approval to the Secretary of State for Transport and EFRA, and the final noise action plan appears.

The final speaker was **Mary Stevens** on behalf of Environmental Protection UK (formerly NSCA), the meeting being timed to coincide with Noise Action Week. This was followed by a discussion of issues raised during the day.

The North-west branch's thanks go to the speakers for their excellent contributions, to Paul Freeborn for organising most of it, and to Salford University for providing the venue.

Meeting Report: North-west branch

Paul Michel. Acoustic camera

North-west based members were delighted to see John Hinton's presidential motorcade arrive at the prestigious Building Design Partnership's new showcase offices in Manchester. John kindly thanked the branch for its work and offered to stay at the end of the meeting to help with any membership issues. Fortunately he kept his remarks short as he had not brought any toys for our entertainment. This was not the case with the evening's speaker, John Shelton of AcSoft. He had been invited to give a technical presentation on the acoustic camera, and was to finish the talk with a demonstration of the device using a tapping machine as noise source. Interest levels were understandably high. They rose even higher when he glossed over much of the more impossible looking mathematics, on the grounds that he had seen it before and it no longer interested him.

The acoustic camera is produced by GFal in Germany and consists of a microphone array, data recorder, calibration tester, personal computer, and extra sensors. The demonstration array on the night consisted of 48 small microphones on a 750mm rim (surprisingly like the one shown on the cover of the November/December 2008 issue of *Acoustics Bulletin*). In the centre was a video camera. The camera provides a picture of the source on the computer screen, and using beam forming technology the microphones superimpose a coloured visualisation of the sound field.

Beam forming goes back to at least the 1880s, but today's technology is a world apart. Sound received at the microphones can be mapped back to virtual sources on a focal plane at a user-defined distance, or onto a 3D CAD model, including enclosed spaces if the spherical array is used. User expertise is necessary when choosing parameters and

placing the microphone array correctly, to minimise artefacts such as grating lobes, and in recognising false sources.

Beam forming is difficult with pure tones, periodic or sinusoidal signals, and much better with broadband, pulses and transients. The spatial resolution is in direct relation to sampling frequency, so this needs to be as high as possible, with 500Hz giving 460mm and 5kHz giving 50mm. Similarly, the more microphones the better, and John is quite happy to sell you as many as you would like. John demonstrated the system's strengths, which included source location in complex fields such as inside vehicle cabs and engine bays, as well as which light was buzzing in an aircraft hanger roof. He also explained its weaknesses.

The camera shows reflections as well as the original source, which can be confusing although it is sometimes useful. Techniques to overcome the problems include covering the reflection or using a different angle of view. Barriers can provide two or more refracted images and no original. Two coherent sources can combine to form a single apparent source which can be checked by blanking out one source to find out if the apparent source then moves.

Overall the acoustic camera appeared to be a powerful tool for source location and acoustic problem-solving, and provided an educational visualisation of acoustical effects.

Well, I knew nothing about the acoustic camera before the meeting, and at least some of the above must be right. Our thanks go to John Shelton for his interesting and entertaining talk, to John Hinton for his most welcome visit, and to BDP for their excellent venue and buffet.

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Daren Wallis.

Introduction

With the coming of IEC 61672: 2002 part 1, the real accuracy of sound level meters underwent a step change improvement. Most apparent changes from the older standards IEC 60651 and 60804 were minor, perhaps the most obvious being the mandated increase in the linear range from 30 to 60 dB. However, a far more important addition was the fact that in 61672, the measurement uncertainty was included in the specified tolerances. This even led to an apparent loosening of a few tolerances, but the reality is that most tolerances were made tighter, and more importantly they were now sensibly specified. This is as it should be, as electronic technology has improved a great deal since IEC 651 in 1979.

When IEC 61672 was published, most professionals assumed that in future sound level meters would become mainly digital – and so it proved. However, while a digital design is usually intended for automatic testing and calibration, these same techniques can also be used when testing analogue instruments. Indeed as long ago as 1998 K D Frankish of Cirrus Research published an InterNoise paper on the then-new technology of fully automatic computer testing. Today, virtually all the major reputable sound level meter companies test their instruments by such fully automatic means. Not only is this far less costly in terms of manpower, it also allows many more parameters to be tested without human interference, or even worse, human error. For example, the CR:800A series, a typical first-generation, fully pattern approved, but relatively old 61672 sound level meter, has over 150 parameters tested and reported on, all without any operator involvement. The precise number of the tests and their extent is a closely guarded commercial secret for each company, but it is very probable that they use substantially similar methods. At these major companies, the number of tests is similar to those used by national test houses when performing IEC 61672 part 2 pattern approval tests: indeed, in some very new instruments, the manufacturers' tests have become even more complex – and more automatic than part 1 tests.

Major manufacturers' test systems not only check the instruments to the full electrical performance of IEC 6172, but also can electronically adjust them to give optimum performance for the user. Some of these adjustments can then be loaded into the operating system (part of the instrument's memory) and also filed in a log file. In this way, things that traditionally would need mechanical adjustment by a manual potentiometer can now simply be a number in a register, and the individual instrument's performance is enhanced.

This automatic testing has other advantages in that manual fault finding – once a major cost in instrument manufacturing – can be almost eliminated, with the result that the reliability has increased to the point where the major companies can now safely offer much longer guarantees on their instruments. A further very significant advantage of automatic testing is that every test parameter is recorded and thus, when an instrument is returned for its annual calibration, the new data can be compared with the old and any significant change investigated. This advantage is of course nullified if the annual calibration or 'periodic tests' are done by a third party, however competent they may be, as only the manufacturer can have the original setting-up data.

IEC 61672: part 3

Part 3 of IEC 61672 is now available under the title 'Periodic tests' and this describes a test regime that either annually or bi-annually re-tests each meter with a sub-set of the full pattern approval tests as described in IEC 61672 part 2. To quote the scope in IEC 61672-3, 'The extent of the tests in this part of IEC 61672 is deliberately restricted to the minimum considered necessary for periodic tests'. Part 3 proved very difficult to produce as agreement was hard to reach on what parameters were critical for these routine tests, in other words what the minimum tests should be. The two extreme views were that the sub-set should only miss out the tests for things that cannot easily change, such as physical shape, which after the microphone mainly determines if the sound level meter meets the directional requirements. Some suggested that such things as temperature, humidity and vibration susceptibility should be routinely checked as well. While this view is logical, it is clear that any

increase in the complexity of the tests may well lead to the cost of an annual test being of the same order as buying the meter in the first place, especially for Class 2 meters. Such a cost is not likely to be acceptable to most users.

The opposing view was that on cost grounds, only a very small sub-set of parameters should be tested annually: for example 'A' frequency weighting, perhaps by means of spot checks at low, mid and high frequencies, followed by a simple linearity test, from the lower to the upper specified measuring range. Finally an acoustic 'user calibration' would be carried out with the specified calibrator. It is clear that such an attenuated test will 'pass' many instruments that are non-compliant, but since before 61672 there was little or no formal annual testing, the average user may be better served and such a regime would at least be affordable by most users. An even bigger argument was 'Should only pattern approved instruments be tested?': eventually it was agreed that part 3 would not mandate this. The argument for not permitting the routine periodic testing of non-pattern-approved meters was basically, that non-compliant instruments could well pass the short test, but would not even be close to passing the full part 2 tests. For example, instruments may be electrically 'reasonable' but have a very poor acoustic performance because of things like case reflections or poor sealing against humidity, and so could never pass the part 2 test. In the end this was 'solved' by the wording in the scope that 'because of the limited extent of the periodic tests, if evidence of pattern approval is not publicly available no general conclusion about conformance to the requirements of IEC 6167-1: 2002 can be made, even if the results of the periodic tests conform to all the applicable requirements of this part 1 IEC 61671'. Clearly, passing part 3 is simply not an indication that the meter complies with the full 61672 requirements. In fact, logic suggests that people might assume – and perhaps even claim – that their instrument is compliant if it passes the part 3 tests.

What militates against the of testing every parameter in periodic testing is of course the labour cost – especially in government controlled test houses, where the overheads are usually large when compared with a commercial company. This leads to the question 'If testing is so expensive, is the manufacturer testing it properly initially?', in other words, how do the manufacturers get round this time and cost dilemma? The answer is, of course, above. All the major manufacturers automatically computer test their instruments in manufacture, leading to huge savings. A number of reputable manufacturers will set their test limits tighter than Class 1 of IEC 61672 for several reasons. Customers do not always treat their instruments carefully and it is important that such usage does not put the instruments 'out of limit' during the period between calibrations. Further many test houses can underestimate their own measurement uncertainty and reputable manufacturers therefore tighten the tolerance limits so that randomly selected instruments will pass their local tests.

Who should be used for part 3 tests?

Because of the power of such computer testing, most professional users today tend to send their instruments back to the original manufacturer for their annual calibration. This has many advantages but probably one of the most important is that only the manufacturer will have the dedicated software to set-up each model to as-new standards. Even if each manufacturer passes their software to approved test houses, this is not helpful unless the test house has an identical test rig. As the reality is that all the top companies have different and very specialised systems, this is impractical. At most major companies, each instrument undergoing any servicing, or simply being submitted for an annual calibration, is put through exactly the same procedure as the initial manufacturing test. At the end of the test procedure, the data is compared with the original test data and any difference has to be resolved; such detailed work can only sensibly be done by the original manufacturer, as only they have the original data. Being fully automatic, the cost of annual testing by the original manufacturer, while not inconsiderable, is far less than the purchase cost of the instrument, yet the test performed is far nearer to a pattern approval test than IEC 61672 part 3 demands and is close to the 'maximum testing' vision originally proposed. To give some scale order; the cost of having a sound level meter, tested to pattern approval standards can be up to twenty times the purchase price of

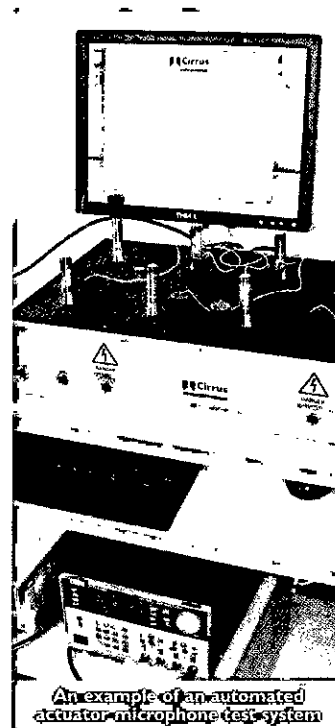
the instrument; whereas the part 3 testing at most major manufacturers tends to be a small fraction of the instrument's purchase price.

To get the lowest price for periodic testing, users can send their meter to a commercial test house, or a smaller competitor that does not have formal UKAS or similar national accreditation. These unapproved types of organisation tend to offer test prices significantly less than either the major manufacturers or approved test houses – the reason may well be that they skip many of the important tests. The question is whether such testing meets formal requirements.

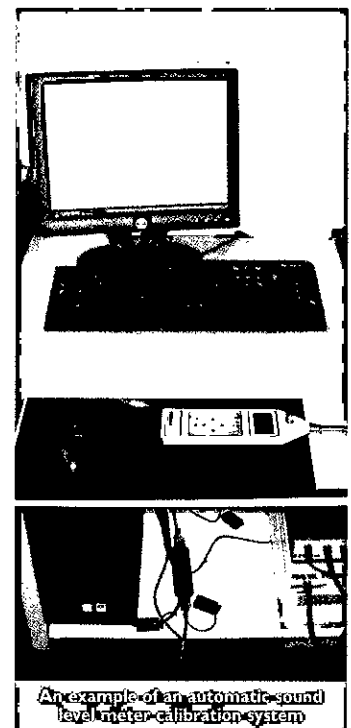
Users can also send their units to an 'Approved' test house that has full UKAS accreditation, and such an organisation will be able to carry out the exact procedure mandated in part 3 and issue a formal certificate exactly as officialdom desires. From such an approved test house, the test will be correctly carried out, with known and stated uncertainties, but will probably be limited to the very small sub-set of tests in part 3, without any automatic adjustments made.

The third alternative is to send the instrument back to the original manufacturer, who will usually re-test and automatically set up the instrument to the exact original performance; effectively putting the instrument back to its new condition. If the instrument was claimed to meet IEC 61672 part 1 when new, logic suggests that it will continue to be meet the standard, and some major manufacturers will extend the guarantee to as much as 12 years.

Daren Wallis, co-opted member of the Measurement and Instrumentation group



An example of an automated acoustics microphone test system



An example of an automatic sound level meter calibration system

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AQ8JF9

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A08 HT6

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out of hours on 07834 775 863. Good luck in your job search!

Meeting report: Midlands branch

Kevin Howell. Issues in the application of PPG24 and BS.8233

For the final Branch meeting of 2008 a large audience gathered at Loughborough University where Stephen Turner (Bureau Veritas) gave a thought-provoking presentation about how we use (or misuse) PPG24 and BS.8233. He first asked us to consider some questions. What are we doing? How are we doing it? Do we get it right? Do we explain satisfactorily to others what we are doing? He emphasised that the presentation represented very much his personal views.

He noted that PPG24 and BS.8233 are both widely-used national documents, but are not consistently applied. PPG24 has been under revision for some time, but this revision was currently on hold until the Planning Bill, and any associated guidance, became clearer. There were no plans for a revision of BS.8233.

He observed some similarities and differences between the assessment of noise and the assessment of air quality (AQ). AQ assessment is more straightforward because there are relevant and applicable AQ standards, and the effect of the pollutants (eg NO_x) are the same irrespective of their source.

For noise annoyance assessment, research showed large differences in response to the same noise dose. Nevertheless, noise professionals were still expected to 'draw a line'. Once the line was drawn then non-acousticians interpreted it as a strict limit despite the fact that we know we cannot measure or hear a difference between levels just to either side of this line. Perhaps we should make an effort to develop our methods further? Are we just being lazy in not doing so? We continue to rely on methods developed years ago. For example, to calculate L_{Aeq} for road traffic noise we now apply a (TRL-derived) back-end correction to L_{A10} which is based on CRTN, and that document was last updated 20 years ago.

Stephen was concerned that many people consulted standards only to select numbers from the tables, and often did not even read the table correctly. It was vitally important to read the supporting words as well. For example, in BS.8233 the text explains that tables 5 and 6 are only relevant for 'anonymous' noise. Nevertheless, these limits are used in all sorts of inappropriate circumstances. The figures in BS.8233 were taken from WHO guidelines. Therefore, to understand BS.8233 it is absolutely necessary to understand the WHO guidelines also.

Stephen raised a fundamental question: should targets such as those quoted in BS.8233 even be part of a British Standard? Limits and restrictions were normally the result of political discussion. Should scientists therefore not establish noise limits at all, but instead present the available research data to the politicians and let them set the limits?

PPG24 contains much information relating to new housing in noisy areas, but little on noisy activities brought into residential areas. Why are the two sets of circumstances treated differently? This is probably because our responses to changes in noise level are different from our responses to noise level alone. Before the work on the revision of PPG24 was suspended, significant progress was being made in this area, and Stephen hoped that this work would eventually be used. One new area to be addressed would be that of guidance on mixed-use developments.

Another concern of his was the misuse of the often-quoted rules that a 3dB change in noise level was the minimum perceptible difference, and that a 10dB change was a doubling or halving of loudness. He stressed the importance of using these rules only when referring to a particular noise level, and not to a calculated noise index. For example, when calculating the $L_{Aeq(16h)}$ index for aircraft noise, if the number of aircraft in the final hour were to increase fourfold then the $L_{Aeq(16h)}$ would increase by only about 0.5dB, an apparently insignificant change. However in the final hour the $L_{Aeq(1h)}$ would increase by 6dB, clearly a very noticeable effect.

PPG makes reference to BS.4142. Stephen commented that BS.4142 was first published in 1967, and that it came out of the Wilson Report of 1963. So to understand fully the application of BS.4142 it was necessary to go back to the Wilson Report: this makes an interesting read with the benefit of 45 years of hindsight.

Stephen concluded by urging that everyone, when using guidance of any sort, should ensure they understood its origins and read carefully the supporting text as well as the tables. The many issues raised by the presentation provoked a lively question-and-answer session.

Grateful thanks are offered to Stephen for his excellent presentation, and to Loughborough University for hosting the meeting.

Meeting report: Midlands branch

Kevin Howell. 'Sustainable acoustics'

For our May 2009 evening meeting the Midlands Branch returned to Scott Wilson's offices in Nottingham. Richard Greer of Arup Acoustics treated a large audience to a thought-provoking talk on sustainable acoustics and soundscape design.

Richard began by suggesting that the acoustics profession was still trying to determine exactly where it fits into the 'sustainability' agenda. This was not helped by the fact that there was still no real consensus on the meaning of sustainability. He described briefly the Sustainable Project Appraisal Routine (SPeAR), a tool developed and used at Arup Acoustics. SPeAR focuses on the key elements of environmental protection, social equity, economic viability and efficient use of natural resources.

He went on to describe the significant challenges that the need for sustainable design presents to the process of acoustic design, particularly on inner-city brownfield sites. It was important to consider noise issues as early as possible in the design process. To reduce energy consumption there was a need to maximise the use of natural ventilation, which went against the use of sealed glazing for sound insulation purposes. This presented in turn a need to screen noise sensitive facades by the use of appropriate building design and layout, which could be evaluated using noise-mapping techniques, for example, the use of commercial developments to screen residential ones. However, single-aspect design on noisy facades and long screening walls were now, in general, unpopular with planners and with the police. Richard identified several ways of

improving the effective sound insulation provided by an open window. Materials used for acoustical purposes should also satisfy sustainability criteria.

Soundscape design contributed to the sustainability agenda as it could be used to broaden the attractiveness of areas, particularly in cities. A great deal of work had been carried out on noise control issues but relatively little had been done on soundscape design, which could be considered analogous to landscape design and architectural urban design. It involved a critical evaluation of the existing or anticipated soundscape and then the application of noise control measures to unwanted sounds, while preserving and protecting desirable soundscape characteristics. These might include the soundscape ecology (noise from flora and fauna) and keynote sound signatures, events and features. There might be certain 'sonic icons', for example in London the London taxi, the Routemaster bus and the sound of Big Ben. Soundmark horizons could be developed; for example, the distance over which Big Ben could be heard. Could that the horizon be protected or extended? Water features could be used to mask traffic or heating and ventilation system noise. They could even be 'tuned' by choosing an appropriate surface for the water to fall onto.

Richard concluded his presentation by describing several interesting examples of soundscape design from Leeds, Rotterdam, Chicago and Sheffield, and then answered a number of probing questions. A small group then rounded off the evening with a meal at a nearby curry house.

Meeting report: London branch

Ed Weston. Observations on the low-frequency acoustics of listening rooms

A very respectable number of London branch members gathered on the fifth floor of no.1 Proctor Street on 18 March 2009 for a presentation of Gil van Buuren's review of the outcome of parametric studies on the low-frequency acoustics of listening rooms (eg studio control rooms) using a numerical wave model. His aim was to find an accurate means of predicting the modal response and reverberation time in such rooms using computational methods. Gil, who currently works for Faber Maunsell, was driven to undertake this work for his MSc (in association with London South Bank University) by his experiences on the 'other side of the glass'.

The presentation, which was based on his soon-to-be-published thesis, described the criteria he used in the analysis, the computational model, the parametric studies and some further observations arising from a number of additional measurements made outside the scope of the main investigation. A discussion session followed.

Using the practical, thorough and realistic guidance in the European Broadcast Union document EBU Tech 3276, suitable values were chosen for the input and output parameters for the studies. The criteria included limits for the inputs, ie frequency response and directivity of the loudspeakers within the model, limits for the room shape and size, and locations of the loudspeakers and the listeners. Spectral reverberation times and the operational room response curve were chosen as the outputs.

The computational model was then discussed first by defining the Schroeder Frequency (f_s) as 2000 times the square root of the ratio of the T60 to the volume of the room. This frequency was understood to be the threshold between the lower frequency region for which the non-diffuse sound field wave-theoretical model can be applied, and upper frequency region for which the diffuse sound field statistical model can be applied.

Both these models were described. The wave-theoretical model considered the addition of damping in an undamped room of given dimensions. Eigen frequencies and the associated damping constants were calculated, the latter enabling evaluation of the spectral reverberation time and thus the room response curve using sound pressure as an input via the loudspeakers. The statistical model used the Eyring model to compute the operational room response curve using sound power as the input. Gil described a number of idealisations used to simplify the loudspeaker and room models.

The parametric studies explored the outputs from both the wave-theoretical and statistical models for combinations of lightly-damped and well-damped small and large rooms. For the small lightly-damped room, the wave-theoretical model predicted many reverberation time responses associated with the many oblique room modes which corresponded with the Eyring reverberation time predicted by the statistical model. However, the wave-theoretical model also predicted much longer reverberation times associated with axial and, to a lesser extent, tangential modes. This response at frequencies well above f_s for the axial modes contradicts our definition of the Schroeder frequency.

To investigate this further, Gil experimented with varying the strength of the modal coupling between loudspeaker and listener. The strongest modal coupling was achieved by locating the loudspeaker and listener in opposing corners of the room, and was reduced by bringing the loudspeakers and listener towards the middle of the room (thus better approximating a typical studio arrangement). The modal response was between 10 and 30 dB lower in the latter case, but with a more uniform modal coupling (ie a 'flatter', more desirable, frequency response).

The non-uniform modal coupling was also apparent for the larger room. Gil concluded that to achieve the EBU criteria, careful

positioning of the loudspeakers and frequency equalisation was necessary, in addition to the installation of acoustic absorbers which had the unusual characteristic of increasing absorption with reducing frequency.

Gil's further observations followed from his impulse response measurements in a highly treated radio studio using exponential sine source excitation. He ran into signal-to-noise problems with the loudspeaker and microphone located in the lightly modal coupling configuration (ie with both towards the middle of the room). As expected from the modelling work, however, by placing the loudspeaker and microphone in opposing corners, the signal-to-noise ratio was increased by around 30dB enabling the low-frequency room response to be tracked right down to -60dB. The resulting energy decay curves gave the complete room response including the interference between nearby modes.

Gil postulated that this may be the best way to measure reverberation time at low frequencies, and by contrast, the T20 method defined in ISO 3382 may not take full account of energy at low frequencies.

The discussion session covered themes including the unified broadband absorber designed by the BBC in the mid-1990s which exhibited increasing absorption with decreasing frequency, and the appropriateness of considering room shape when dealing with low-frequency sound waves whose wavelengths are too long to 'see' the shape of the room.

The London branch would like to thank Gil for his informative and entertaining presentation.

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Meeting report: Midlands branch

Presentation of best IOA Diploma projects of 2007/2008 (Derby University)

The annual branch visit to Derby University to see presentations by 2007/08 IOA Diploma students took place on 30 September 2008. As usual, the audience was swelled by the newly-enrolled IOA Diploma students.

The first presentation was by Heather Billin on 'Investigation of the acoustical characteristics of pass-bys of three classes of train'. Her objective was to review the published data on the sources of train noise, carry out her own measurements, and then compare the two. From her review she identified the three main sources of noise as traction noise, rolling noise and aerodynamic noise. Heather's modest aspiration of acquiring her own railway test track and trains on which to pursue her studies was sadly dashed very early on! Instead she had to search the region for a suitable monitoring site, which proved difficult: she had to compromise on some of her ideal selection criteria, eventually deciding on a site north of Loughborough, on a diesel-hauled line. She gathered data on three very different types of passenger train: the Class 43 High Speed Train, the Class 222 Meridian and the Class 156 Supersprinter. She found that the quantity of data required to describe adequately each train pass-by (including type of train, pass-by duration and number of vehicle - to calculate speed - and track number) was a great deal for one person to record in the brief period of time available. She measured noise data at either wheel height or roof height, although ideally she would have liked to measure both simultaneously for each pass-by. For each train type she used the measured data to produce a passby SEL, a time history and a third-octave frequency spectrum. Heather presented her data and discussed them with reference to the types of train noise sources referred to earlier. The data generally compared well with the published data. She identified a number of improvements that could be made to her methodologies if a similar study were to be carried out again. Heather closed by suggesting, for the benefit of the new Diploma students, that in order to enjoy low stress project, it must be kept simple, and control of as many variables as possible should be retained.

The second presentation was by Iain Paterson-Stevens on 'Lecture theatre acoustics and speech intelligibility'. Iain works at Nottingham University where there is currently a programme of improving existing lecture theatres and commissioning new ones. When preparing an acoustical specification the

university uses Building Bulletin 93, which is strictly speaking intended for schools and colleges, but there is no equivalent guidance for the higher education sector. BB93 recommendations include, for example, that for a 100-seat lecture theatre, the mid-frequency reverberation time should be about 0.8s, the background noise level should be less than 30dB L_{Aeq} and the speech transmission index (STI) should be a minimum of 0.6 at all listener positions. The university has a high proportion (some 60%) of international students and also employs many international lecturers. Iain's project was to investigate how meaningful the STI might be as a criterion when the speaker or listeners, or both, are not native English language speakers. Iain carried out his study in a recently refitted lecture theatre that had been reported anecdotally as very good. The background noise level was somewhat high, at about 43dB L_{Aeq} (30min), owing to the proximity of a very busy road. The reverberation time was within the 0.8s limit except at low frequencies. Iain first carried out an objective assessment of the STI at 59 positions and found that values ranged from 0.65 to 0.82. He then undertook some subjective tests using modified rhyme tests, with two groups of eight student listeners. One group was composed of UK students, and the other of international students for whom English was not their first language. He tested each group twice, once in the seats with the highest objective STI scores and once in the seats with the lowest. He found that the UK students' scores led to an STI of 0.7 in the best seats and 0.5 in the worst. The international students' scores were 0.5 in the best seats and only 0.25 in the worst. He concluded that STI criteria should be used with caution when considering international students. He closed by identifying a number of improvements to the method that he would like to try in the future.

As is now the custom Scott Wilson Ltd offered a prize for the best presentation and this was judged by a panel of four members. After retiring to make their decision their spokesman, Andrew Jellyman, praised both presentations and awarded the prize to Iain, which was duly presented by Paul Shields, the branch chairman. Heather also received a Scott-Wilson 'goody bag'. Both speakers are congratulated on their work, and thanks are once again offered to John Pritchard of Derby University and to Scott Wilson.

Meeting report: South-west branch

Tim Clarke.

On 14 May 2009 the first South-west branch meeting to be held in Exeter for quite some time took place. It was kindly hosted by WS Atkins' local office and focused on the topic *Unattended environmental noise measurements – a cost-effective method or a can of worms?*. There was a good attendance of 23 delegates which demonstrated the need for more meetings in this part of the branch area.

The meeting was opened by Tim Clarke, branch chairman, who as well as welcoming the attendees also had the pleasure of introducing the Institute's President, John Hinton OBE, who gave a short address. John informed us that during his period of office he was endeavouring to visit as many branches as possible. He also stressed the importance of the roles that the branches had in not only getting acoustics professionals together, but also, in these times of recession, being able to offer good value, ie no-cost, meetings to members for their continuing professional development.

Following the President's address Mike Wright of WS Atkins gave a very thought-provoking presentation about the risks of unattended noise measurements, highlighting the reasons for the many uncertainties about what was actually being measured at any given time. As well as discussing atmospheric, meteorological and other causes Mike also spoke, from his own experience, of electrical discharge corona effects, which had resulted in significance interference with measurements near overhead power lines. He also referred to a developing concept from an Australian company, SoundScience Pty Ltd, involving a triangular array of microphones. That

company suggests that the system should have applications where noise from a single source needed to be monitored in isolation, or where other noise sources needed to be excluded from a measurement.

Mike had also arranged for John Campbell, of Campbell Associates, to talk from the instrument supplier's perspective. John's presentation showed how the current availability of sophisticated instrumentation and enhanced processing capabilities, together with audio playback, and even video playback, could address many of the uncertainties highlighted in both speakers' talks. He agreed however that attended measurements were preferable even though both recognised that this was not always practicable in the real world.

One delegate unwittingly created a moment of hilarity by his comments which opened 'When you get a bulge at 4 in the morning...'. After the laughter had finally died down and he was able to continue, the other delegates were somewhat relieved to hear that he was referring to nothing more risqué than the impact of the dawn chorus on the measurement trace. This was one of a number of natural effects that both Mike and John had included in their presentations and which could give rise to a marked increase in recorded noise levels.

At the end of a very successful meeting some of the delegates were able to take up the open invitation to continue their discussions on a less formal basis by adjourning to a local Indian restaurant for some welcome refreshment.

A stalwart of the Institute retires as Secretary of the Membership Committee

Rob Hill

Having written his last set of committee minutes, Rob Hill has relinquished his long-held post of Secretary of the Membership Committee.

Records of his joining the committee are slightly hazy, but it was during the period 1980 - 1983, and by 1988 his well-known eye for detail soon made him the obvious choice to become Secretary of the committee. This is a post he filled without a break until the committee meeting held in February 2009. In his work for the Membership Committee and before that for Council, Rob was instrumental in establishing precise terms of reference for the Institute's committee structure and developed a reputation as a strict adherent of the rules. It seems likely that the applications of the majority of our current membership have benefited from Rob's detailed attention! Rob's overall service on the Membership Committee, exceeding a quarter of a century, probably makes him the prime candidate for the Institute's longest continuously-serving committee member. However, the record is not yet established, because he remains on the committee as an ordinary member and there are, no doubt, a good few years yet to run!

Aside from his work on the Membership Committee, Rob Hill has been associated with the Institute from its earliest days having formerly been a Member of the British Acoustical Society. Indeed, Rob is one of a very select group, having attended the two inaugural General Meetings arranged to set up the Institute's membership structure. Neither

meeting was quorate, though the second was legitimate under the rules, with Rob being the only attendee other than the original group of honorary officers.

Rob worked for the scientific branch of the Greater London Council from 1966, from which base he became a member of the founding committee that started the London evening meetings in 1977. He served on that committee for some three years until he moved to Acoustical Investigation and Research Organisation Ltd (AIRO) in 1979 where he continues to perform his 'day job' — now as a principal consultant with particular interests in transport noise and planning related noise issues. The London evening meetings continue to be a very popular cornerstone activity of the Institute's London branch.

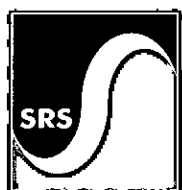
Rob was elected to Council as an Ordinary Member in 1980 and served as the Institute's Honorary Secretary from 1983 to 1989. Incidentally, Rob's wife Alison was Editor of *Acoustics Bulletin* from October 1979 until the end of 1986, so for several years the Institute became something of a Hill 'family occupation'.

Rob Hill was elected a Fellow of the Institute in 1986, and is also a Member of the British Computer Society and a Chartered Information Technology Professional. His service to the Institute was recognised in 2003 through the presentation of a well-deserved Award for Distinguished Services, and it is now appropriate again to express our appreciation for Rob's substantial contribution to the life of the Institute.

Tony Jones HonFIOA



Rob Hill



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Comparison of the ground vibration levels

Andrew Mitchell. Induced by a bus travelling over a set of road cushions and a conventional speed hump

Introduction

It is widespread practice for councils to install traffic calming devices to control speed and reduce through traffic in suburban streets. Where these streets form bus routes, it is becoming common to use road cushions instead of conventional calming devices such as speed humps or chicanes. This article compares the ground vibration levels generated by traffic, and in particular, buses, at a set of road cushions with those at a conventional speed hump.

On bus routes, conventional speed humps and chicanes, can be undesirable for a number of reasons, such as:

- Conventional traffic calming measures may unacceptably slow the progress of the bus;
- Reduced passenger comfort may result from the motion of the bus as it negotiates the hump or chicane;
- Ground clearance issues can cause problems over speed humps, particularly with the newer low-floor buses;
- Manoeuvring issues can arise at chicanes, where precise positioning and turning of the bus is required to negotiate the chicane without driving over kerbing with the rear wheels. These issues are often exacerbated by cars parked on the street near the chicane.

To avoid these undesirable effects, road cushions are often used by councils for control of speed and general traffic flow in streets that form part of an urban bus route.

Road cushions are hard plastic or rubber pads that are bolted to the road. Typically three pads are installed in a line across the road at each slowing point. The width of each pad is such that the wheels of buses, and other vehicles with a wide wheel track, can pass on each side of the pad, removing the need to slow if the wheels are aligned correctly (see Figure 1). Cars and other light vehicles with a narrower track must drive over the pad with at least one set of wheels.

The heights of the pads are lower than typical speed humps, to avoid ground clearance issues with buses passing over them, but the pads are more angular, and hence still present an abrupt bump to light vehicle traffic.

A drawback arises with road cushions, however, if the bus driver does not accurately align the wheels of the bus with the gaps between the road cushions. For a conventional speed hump or chicane, a bus would typically slow to less than 25km/h to negotiate the slowing point safely. Conversely, at road cushions, buses do not need to slow down significantly, and typically pass through the road cushions at 45 to 50 km/h. If the wheels of the bus are poorly aligned with the gaps between the cushions, and hit the cushion at this speed, a considerable bump or jolt can be experienced by the bus. Although bus drivers generally attempt to avoid this situation, it is not uncommon for drivers to misjudge the alignment of the bus wheels (particularly the rear wheels) and clip or run over the road cushion at speed. The energy from this has the potential to cause discomfort to passengers of the bus, and to generate high levels of ground vibration, which has been known to be a source of annoyance to nearby residents.

This article briefly examines the fundamentals of ground vibration propagation and introduces some commonly-referenced vibration guidelines relating to human comfort, before presenting the methodology and results of an investigation that was performed to determine the differences between the vibration levels generated by a bus travelling over a set of road cushions and a bus travelling over a conventional speed hump. Based on the results of this investigation, empirical models are proposed for the prediction of ground vibration due to buses travelling over road cushions and speed humps. These models may be used to evaluate the potential for adverse affects on the amenity of residents in the vicinity of proposed slowing points, and may assist in determining which type of traffic calming measure should be installed.

Propagation of traffic vibration in the ground

Vibration propagates through the ground as compression waves (termed P-waves), shear waves (termed S-waves) and Rayleigh waves (termed R-waves or surface waves). As the waves propagate radially outwards from the vibration source, the vibration energy is spread over an increasing area. This spreading of energy results in a reduction of vibration levels with distance from the source, termed geometrical attenuation.

In addition to geometrical attenuation, the waves dissipate energy through soil damping. The rate of soil attenuation is dependent on a number of factors including soil type, moisture content, and temperature.

The theoretical model for the propagation of vibration in the ground is as follows:

$$v_2 = v_1 \left(\frac{R_1}{R_2} \right)^\gamma e^{\alpha(R_1 - R_2)} \quad (1)$$

Where v_1 and v_2 are the vibration levels at radius R_1 and R_2 from the vibration source, γ is the geometrical attenuation coefficient, and α is the soil attenuation coefficient. Published values of α range from 0 to 0.44 [1].

The majority of vibration energy received at a point on the surface due to a vibration source at surface level, such as a vehicle hitting a bump, is attributed to Rayleigh waves [5]. For Rayleigh waves, the value of γ is 0.5.

Vibration criteria

There are generally three levels of potential adverse effects of vibration in buildings. These levels in order of reducing sensitivity are:

- People may be disturbed or inconvenienced;
- Equipment and fittings may be disturbed or affected; and
- Cosmetic or structural building damage may be induced.

Vibration criteria relating to human comfort are the most stringent. This is because people are able to 'feel' vibration at levels much lower than those required to cause even superficial damage to the most susceptible classes of structures. In most situations, vibration associated with road traffic is not sufficient to cause even cosmetic damage to buildings.

Australian Standard 2670-2:1990 [2] provides guidance for evaluating the potential of vibration to affect human comfort adversely in buildings. The Standard presents assessment criteria that are dependent on the frequency of vibration, and the axis in which the vibration is received by the human observer.

Humans are generally most sensitive to vibration in the foot-to-head direction (vertical axis) for the dominant frequencies at which ground vibration due to road traffic is typically observed to occur (8 to 15 Hz). It is for this reason that the assessment criteria presented in AS2670-2 are most stringent in the vertical axis at the frequencies of interest to this investigation.

AS 2670-2 presents evaluation criteria in terms of a base curve (Figure 2) below which vibration levels have not been observed to cause complaints, and a modification factor by which the base curve is multiplied to adjust it for different types of building uses, vibration characteristics, and how often the vibration events occur.

Measurement procedure

Two neighbouring streets in an inner suburb of Christchurch were selected for the purpose of the study.

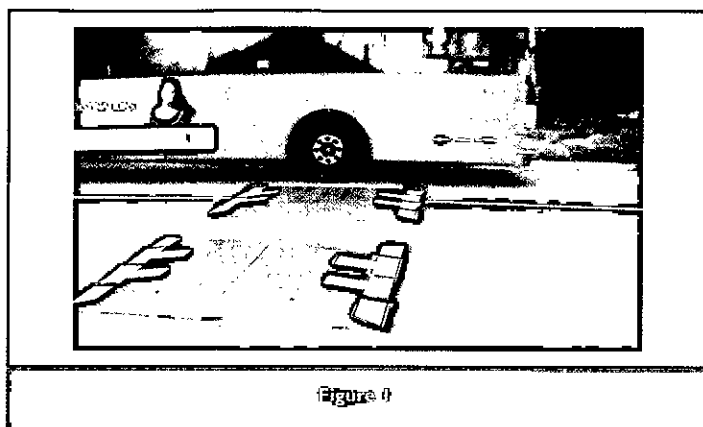


Figure 1

A bus passing over a set of road cushions

- Street 1 was a bus route which had road cushions installed at three points along the street. Approximately 80 buses per day use the street, between the hours of 05:00 and midnight.
- Street 2 ran parallel to Street 1, one block away, and included conventional table-top speed humps as shown in Figure 3.

Geological and soil maps of Christchurch [3],[6], indicate that both streets lie in an area of ground consisting predominantly of Taitapu deep silt loam soils on well sorted alluvial gravels. Owing to the proximity of the two streets to each other, and the similar ground types indicated by the geological and soil maps, it was expected that any differences between the rates of ground attenuation at the two locations would have been minimal.

To provide control over variables such as speed, and whether or not the bus hit the road cushion, a standard city bus (11m long, 8900kg tare) was chartered for the purpose of the measurements. The driver was instructed to drive past the measurement location at specified speeds, either clearing or driving over the top of the road cushion with the wheels of the bus, as required. Apart from the driver, the bus was unloaded for the duration of the tests.

Measurements of each scenario were performed at a range of distances from the road cushion. Each test was repeated several times to ensure that valid and repeatable results were being obtained.

A similar set of measurements was then performed with the bus driving over a conventional speed hump on Street 2 at various speeds.

The vibration measurements were performed using a calibrated Commtest VB2000 vibration analyser, with an IMI type 603C01 accelerometer, configured to measure peak velocity in the frequency range of 1 to 200 Hz. The Fast Fourier Transform (FFT) was performed using a Hanning window.

All measurements were performed with the accelerometer axis aligned vertically, as this was determined to be the axis in which the maximum levels of vibration occurred.

Normalisation of measurement results

Since the bus passed at a slightly different distance from the measurement location in each test, the measurement results were normalised to a single distance to enable a valid comparison to be made between the results of each test. The selected distance for normalisation was 18m from the centreline of the bus as it passed over

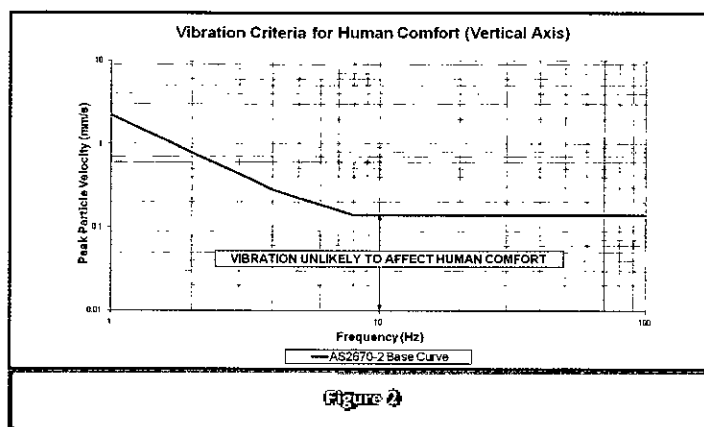


Figure 2

AS2670-2 base curve (vertical axis)

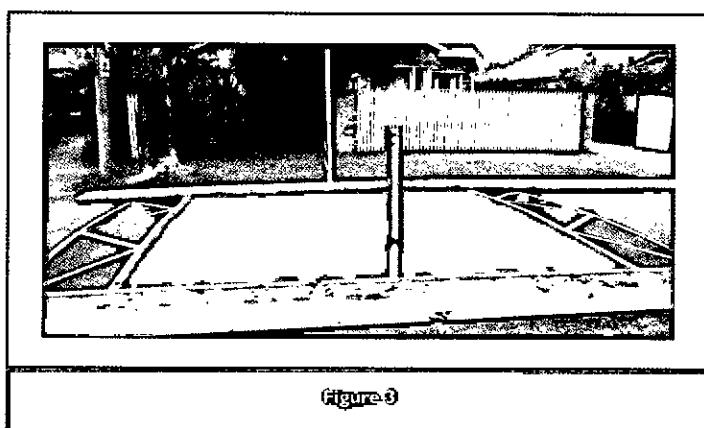


Figure 3

Flat-top speed hump on Street 2

the road cushion. This was the typical distance from the centre of the nearside traffic lane to the front of the residential buildings in the vicinity of the slowing points on the test streets, and thus enables direct comparison of the results with the human comfort criteria presented earlier.

For each measurement, the equivalent vibration level at 18m was calculated using Equation (1). The soil attenuation coefficient was determined by fitting a curve of the form of Equation (1) to a graph of measurements performed at different distances from the bus when hitting the road cushion at 50km/h.

Results

Maximum vibration levels due to the passing bus were typically found to occur at a frequency of 10Hz. Table 1 presents a summary of the measurements, normalised to a distance of 18m from the centreline of the passing bus.

Figure 4 shows the measured variation of ground vibration level with distance from the bus hitting the road cushion at 50km/h, and the curve

continued on page 40

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Comparison of the ground vibration levels - continued from page 39

fitted to the data to calculate the soil attenuation coefficient, to enable normalisation of the main results to a constant distance.

Based on the above curve, a soil attenuation coefficient (α) of 0.026 was determined. This was consistent with published values for silt soils [1].

Discussion

At a frequency of 10Hz the value of the AS2670-2 base curve is 0.14mm/s¹. Based on the number of bus pass-bys per day, and thus the potential number of vibration events per day, and bearing in mind that some buses pass during the night, AS2670-2 indicates that vibration levels of up to four times the base curve values may be generally acceptable in terms of human comfort for residential dwellings. Therefore, in accordance with the guidance presented in AS2670-2 it is expected that vibration levels of less than 0.56mm/s¹ at 10Hz would generally be acceptable in terms of human comfort, for this particular situation.

The measured results show that for the ground type at the measurement locations, the vibration from a bus driving over a road cushion at 50km/h without hitting it does not exceed an acceptable level at a distance of 18m from the road. Similarly, a bus driving over a speed hump at a safe speed is unlikely to generate sufficiently high vibration levels to cause discomfort within a residence located 18m from the road.

At a given speed the bus was observed to generate slightly higher levels of vibration when it hit the road cushion, than when driving over the speed hump. Vibration levels in excess of the guideline criterion were measured when the bus wheels hit the road cushion at 50km/h.

Based on the measured results, and on Equation (1), the following Equation (2) is derived to predict the 10Hz vibration v (mm/s) at a given distance R (m) from the centreline of the unloaded bus driving over a road cushion at 50km/h.

$$v = 6.14R^{-0.5}e^{\alpha(1-R)} \quad (2)$$

This can be extended to the general case for any speed and vehicle mass if it is noted that the vibration level is related to the source energy E by Equation (3) (from reference [4]):

$$v_2 = v_1 \left(\frac{E_2}{E_1} \right)^{0.5} \quad (3)$$

Assuming that the energy transmitted to the ground is proportional to the kinetic energy of the bus, and therefore to the square of the velocity, Equation (4) can be derived to predict the vibration level at a given distance from a bus of mass m (kg) hitting a road cushion at velocity U (km/h).

$$v = 1.30 \times 10^3 U \left(\frac{m}{R} \right)^{0.5} e^{\alpha(1-R)} \quad (4)$$

Similarly, Equation (5) can be derived to predict the vibration level at a given distance produced by a bus driving over a 'table-top' speed hump:

$$v = 5.99 \times 10^4 U \left(\frac{m}{R} \right)^{0.5} e^{\alpha(1-R)} \quad (5)$$

In practice, the amount of energy that is converted to ground vibration would also be influenced by a transfer function determined by characteristics of the vehicle suspension, tyres, and loading, and by properties of the road cushion or speed hump. As this transfer function is difficult to quantify, it is recommended that the above equations are used with caution.

From a sensitivity analysis performed on the spread of vibration results, it is estimated that the Equations (4) and (5) can be used to

Vibration source	Typical 10Hz ground vibration level 18m from source (PPV, mm/s ¹)
Bus hitting road cushion at 50km/h	0.7 to 1.1
Bus driving over road cushion at 50km/h without hitting it	0.1
Bus driving past at 50km/h on a section of road between road cushions	0.1
Bus hitting road cushion at 25km/h	0.3 to 0.5
Car travelling over road cushion	< 0.1
Bus driving over speed hump at 35km/h (maximum safe speed)	0.3
Bus driving over speed hump at 25km/h	0.2
Car driving over speed hump	< 0.1

Table 1

Results of measurements

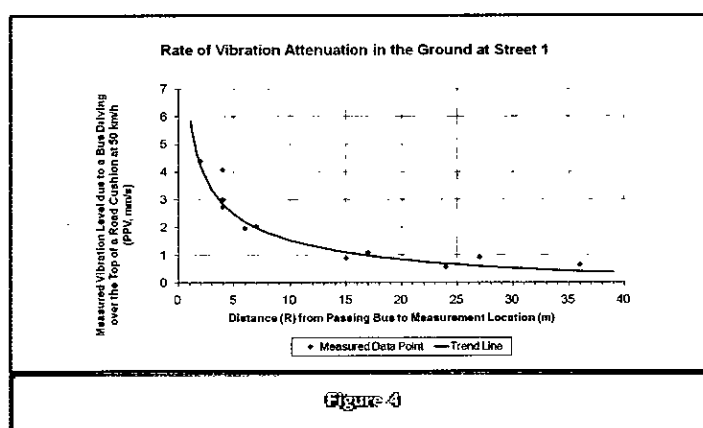


Figure 4

Rate of vibration attenuation in the ground

predict the vibration levels from these types of traffic calming measures within a margin of error of $\pm 25\%$. It is not known how geometrical factors or material properties of the road cushion or speed hump influence the levels of vibration generated, but the geometry of road cushions does not appear to vary widely in New Zealand, at least.

Equations (4) and (5) may be useful in identifying whether the installation of road cushions or speed humps would result in adverse vibration at a particular location. However, in determining the potential vibration impact that one measure or the other may have on nearby residences, consideration would also need to be given to the frequency with which significant vibration events occur (eg the typical number of buses per day that would misjudge the wheel positioning and hit a road cushion) and the typical speed distribution of buses causing these vibration events. These factors are not been addressed in depth here. It is suggested that this would be an area worthy of further investigation if the vibration levels predicted by Equations (4) and (5) are to be assessed effectively in practice.

Conclusion

When buses pass over a road cushion without hitting it, the level of ground vibration generated is not significant. If the wheels of the bus hit the road cushion as the bus passes over, an excessive level of vibration may be generated, depending largely on the speed of the bus.

A bus hitting a road cushion at a given speed appears to result in slightly higher levels of ground vibration than would occur if the same bus travelled over a conventional speed hump at the same speed.

Empirical models to predict the level of vibration generated by buses passing over these types of traffic calming measures have been proposed.

In assessing the potential vibration impacts from a road cushion, consideration must also be given to the likelihood of occurrence of a significant vibration event. Buses typically travel over speed humps at lower speeds than over road cushions, and the vibration levels due to speed humps are generally much lower than those that occur at road cushions. However, it is unlikely that the road cushion would be hit by every passing bus, meaning that the overall impact would be potentially lower. Further investigation of these factors is required if the results of the empirical prediction models are to be interpreted meaningfully.

Acknowledgments

This article was written based on data gathered as part of a study undertaken for the Christchurch City Council. The author gratefully acknowledges the contribution of the Christchurch City Council in providing the motivation and funding for the initial study.

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Noise on board ship

Professor Henry E. Armstrong. From The Times, 7 August 1933

"Damnable" inventions other than steam are being applied to ships. The Times has often voiced complaints against street noises - the organ-grinder has long been regarded as a public nuisance and even the street band: both are now rare, if not extinct. Unfortunately, the organ-grinder is reappearing on ship board, in the far less tolerable form of the raucous, very loud-speaker gramophone and wireless so-called "music". All my life I have been a traveller on the Thames. I went recently to Ramsgate and back. A more perfect day for the water could not have been, but in going to sea we seek peace and content, the enjoyment of clean air, and getting away from the town. Instead of

which, except during rare intervals, we were brayed at from every angle by a horrible noise-producing mechanism which only occasionally simulated music; on deck our ears were everywhere offended by the noise; the saloon was a veritable pandemonium, worse than the streets of Rome. Quiet talk with a neighbour, even reading, was impossible; proper enjoyment of the charms of river and sea was ruled out. On these trips the beauty of the side waves and of the ship's wake is enough to fill the eye with joy; the throb of the engines, the beat of the paddles, is a sufficient and the only appropriate music.

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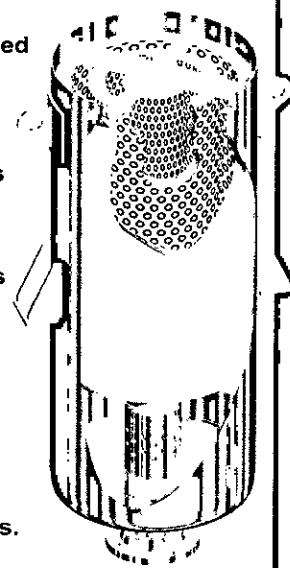
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Acoustical design of the Amaryllis Fleming Concert Hall

Peter Rogers. Royal College of Music

The author noticed the short summary about the RMC Amaryllis Fleming Concert Hall provided by Arup Lighting, on page 40 of the May/June 2009 issue of *Acoustics Bulletin* (vol.34 no.3), and was somewhat at a loss to understand why a lighting article had appeared in an acoustics magazine.

There might have been a feeling that the summary was deliberately misleading the reader to suggest that Arup was also responsible for the acoustics on the project, which it was not. The line 'a key design aim was to provide an elegant technical solution' was sufficiently vague that the *Bulletin* readership might benefit from a clarification. The Editor freely admits that he was misled in this way, and is happy to be able to give an opportunity to Cole Jarman, the acoustical consultancy which did, in fact, form part of the design team, to set the record straight.

The following short article is the result. It makes interesting reading and would have merited inclusion in *Acoustics Bulletin* by any standard.

Introduction

Concert hall design presents challenges not experienced elsewhere in acoustical consultancy. Add to the mix the complexities of a Grade II listed building, a tight construction budget, and a visual aesthetic which can humble even the most aspiring individual, and the challenges are multiplied. To top it off, add a college full of people who have some of the most critical ears in the world, and you have a project which has been a unique experience for all involved.

The Royal College of Music was founded in 1883 and is today one of the world's leading music conservatoires, with over 600 students from more than 50 different countries. The main concert hall was designed by Sidney Smith (who went on to design the Tate Gallery), built in 1901 and, despite having had a number of minor refurbishments previously, was in need of a makeover. The concert hall transformation project therefore began in early 2007.

Project lead was taken by architects Darnton EGS, and Cole Jarman was appointed as the acoustical consultant at an early stage to undertake extensive consultations with the college. The outcome of these consultations established the extent and remit of acoustic works to be undertaken as part of the refurbishment. Most notably this included (1) a substantial improvement of the sound insulation of the external building fabric; (2) a new ventilation system which remained within stringent noise level criteria; and (3) the maintenance and enhancement where possible of the much-loved acoustic response of the hall. Extensive acoustic tests of the hall were then undertaken to quantify the subjective views of the college, and this informed the acoustic design.

Acoustical isolation

Noise intrusion into the hall was found to be a special concern, since the sound of practising musicians in other parts of the building could often be heard in the hall along with many other environmental noise sources. The external building fabric leaked like a sieve, with bespoke sound insulation measures being required throughout. Of most interest were the windows, for which a secondary timber framed glazing system, using thick laminated glass, was designed to upgrade the existing sound insulation performance without any compromise on their visual aesthetic.

Ventilation noise

The existing ventilation arrangements used a high-level displacement system with low-level extract, although comfortable conditions could often only be achieved if high level windows were open. By sealing the

windows, for reasons of sound insulation, a complete replacement of the ventilation system was necessitated. This was easier said than done, since there was no space at low level to provide ducted ventilation according to the preferred method.

Working closely with mechanical services consultants Richard Stephens Partnership, a high-level jet diffuser system was designed and installed. Despite airflow velocities through each diffuser being approximately 4ms⁻¹, and the large number of diffusers (56) located in the ceiling, a ventilation noise level achieving less than NR20 has been provided in the hall.

Acoustic response

The consultation process revealed the general view that while the hall suffered from poor clarity, particularly between musicians, lack of bass response, and a rather overpowering level of sound from a full orchestra, its overall character suited chamber music and was appreciated by the users. Any modifications made to address the stated deficiencies were not to be at the expense of what was loved. The message was 'gently, gently: let us not change irrevocably the nature of the hall'.

Following extensive investigation and scale modelling, it was concluded that the reverberation time was slightly too long in the lower middle frequencies, and that this was emphasised by a lack of low-frequency reverberation and a focusing effect from the barrel-vaulted ceiling. The team therefore set out to consider the means of addressing these issues, whilst maintaining some of the characteristics preferred by the college in terms of acoustic response and visual aesthetics.

Part of the solution was to develop a bespoke perforated plaster ceiling panel, with absorption characteristics designed to 'tweak' the lower mid frequency response of the hall. During the development of these panels, however, it was found that the predicted response did not fully coincide with that measured in the reverberation chamber. While the theory accurately predicted the resonant absorption frequency for a given perforation pattern, panel depth, and material substrate, the tests indicated the absorption bandwidth to be rather narrower than was anticipated. Attempting to achieve the desired response using a construction based on just one perforation pattern was therefore not going to be optimal, and three permutations were finally implemented.

Application of these panels not only altered the reverberation times, but also helped to reduce the focused reflections from the ceiling. Furthermore, the special type of plaster used (Jesmonite) is denser and thicker than the previous ceiling construction, helping to increase the reverberation time at low frequencies.

After an 18-month, multi-million pound refurbishment programme, the inaugural concerts in the Amaryllis Fleming Concert Hall were performed to critical acclaim. Performers and audience alike were delighted with the remodelled hall, and the acoustic has been described as 'bright and precise' and 'clear' in recent reviews.

According to Bob Briggs, *Seen and Heard International*, the hall is a triumph and the RCM can be very proud of it: it was money well spent and the hall would host many superb concerts in the years to come. He, for one, would always be looking forward to his future visits there.

David Suggitt, project architect with Darnton EGS said that Cole Jarman provided an exemplary service for the project. Their grasp of the client's overall aspirations for the acoustic was sympathetically applied to great effect and their ability to work within the team was admirable.

Peter Rogers MIOA is with Cole Jarman, tel +44(0)1932 829007, www.colejarman.com

The problem of noise created by rainfall on profiled metal roofing systems

Richard Sherwood.

Acoustic innovators Sound Reduction Systems Ltd have developed Raincheck, an acoustic damping material designed to reduce the noise generated by rain falling on metal profiled roofing systems. Raincheck is a 1mm thick, 1.9kgm^{-2} , self-adhesive damping membrane.

Rain falling on metal profiled roofs can cause a nuisance in many different environments, including commercial offices, schools, hospitals, and industrial units.

The problem of rain noise on profiled metal roofing systems is a well-documented one, yet a test procedure to measure rain noise in the laboratory was only officially published in 2006, after extensive research by the Building Research Establishment. BS EN ISO 140-18:2006^[1] outlines a method of simulating rainfall under ideal conditions, using a water tank with a perforated base suspended above the test specimen, with a receiver room below (*Acoustics Bulletin passim*). Drop diameter and flow rate can be controlled, flanking sound transmission suppressed, and background noise monitored, making the process reproducible. Such controlled conditions would not be possible in the 'real world', and outdoor measurements are not practical, nor would they yield any useful results for comparing different acoustic damping systems. Real rainfall can only be considered useful for validation purposes.

rainfall type	rainfall rate mmh	volume median drop diameter mm	fall velocity ms ⁻¹
intense	15	2	4
heavy	40	5	7

Table 1

Characteristic parameters for artificial raindrop generation^[1]

BS EN ISO 140-18:2006^[1] states that the rainfall type used for comparison between different products should be 'heavy' rain. Heavy rain, which has a rainfall rate of 40mmh^{-1} , simulates rainfall that occurs once every 50 years. 'Intense' rain, which has a rainfall rate of 15mmh^{-1} and is also described in the standard, simulates rainfall conditions that occur once every two years on average.

Within BS EN ISO 140-18 the measurement of rain noise radiated by a roof element is quoted in terms of the sound intensity level L_i , in dB re 10^{-12}Wm^{-2} . This can either be measured directly using a sound intensity probe, or calculated from sound pressure level measurements in a test room beneath the roof element.

The problem of noise created by rainfall onto metal profiled roofing is highlighted in Building Bulletin 93^[2], the document that governs acoustic performance within schools. Although BB93 does not set any performance targets itself, it recognises that commercial damping materials are required and that roofs that do not have this treatment

are unlikely to provide sufficient resistance to the transmission of rain noise.

Other standards are a little more specific. With respect to the problem of rain noise in schools, BREEAM^[3] recommends that 'the reverberant sound pressure level in a space that has been calculated using laboratory test data with heavy rain noise excitation as defined in ISO 140-18 should not be more than 20dB above the indoor ambient noise levels in Table 1.1 of BB93'.

Health Technical Memorandum 08-01: Acoustics^[4], the document governing acoustical conditions within hospitals, specifies similar criteria. It states that 'indoor ambient-noise levels during "heavy" rainfall, as described in BS EN ISO 140-18, should not exceed the intrusive noise criteria in Table 1 by more than 20dB, or should not be more than 65dB(A), whichever is lower'.

All the above documents recognise that profiled metal roofing used without a damping material is unlikely to provide sufficient resistance to impact sound from rain on the roof.

SRS Raincheck is an appropriate damping material in this context. In independent acoustic tests it was shown that the addition of Raincheck to 60% of the area of a profiled metal ceiling gave large reductions in the sound intensity level from rainfall.

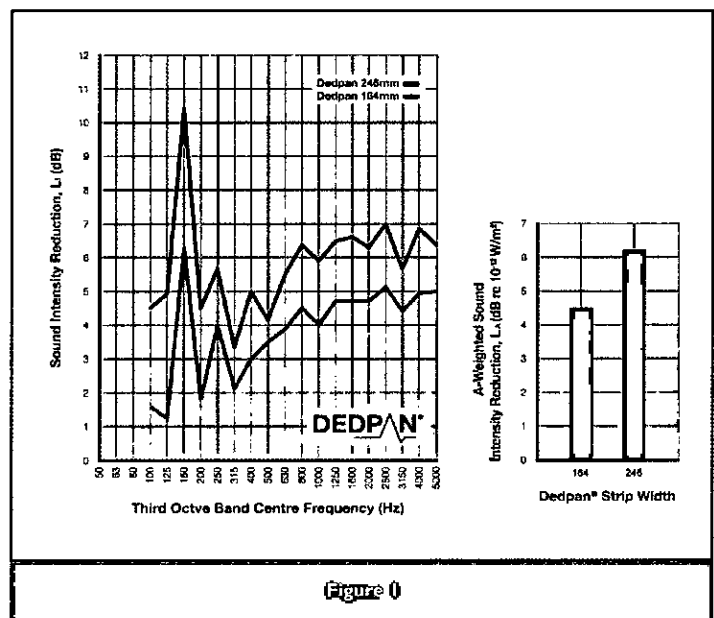
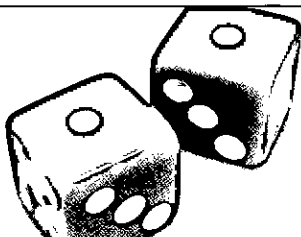


Figure 1

Test reference: WS219329 02/09/2004. Test subject: (3.7m²) five 400mm wide strips, 0.9mm gauge, 3.5kgm², ribbed aluminum standing seam roof with stucco emboss, installed at a pitch of 7° below the water tank.

continued on page 44



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The problem of noise created by rainfall - continued from page 43

Installation of Raincheck onto profiled metal roofing is very simple. To begin the installation a small section of the carrier paper is removed from the back of the material and the exposed adhesive is used to attach the membrane to the metal profile. Once the initial contact is made, moderate hand pressure or a hand roller should be used to compress the Raincheck to the profile metal roof, with the installer removing the carrier paper whilst working along the profile. As the material is lightweight and flexible it will easily mould to the contours of the roof.

For the best results SRS recommends that a surface area equivalent to 60% of the total roof size is treated with the Raincheck product, using an even distribution of the material across the space.

There is now a simple solution to the issue of rain noise in commercial, industrial and educational environments. For a demonstration the product can be found on a YouTube channel at www.youtube.com/soundreduction. Anyone requiring further details, a sample of Raincheck, or a discussion of a particular application

in greater detail, should feel free to contact the company's technical team on **01204 380074** or email info@soundreduction.co.uk. All product information can be downloaded from www.soundreduction.co.uk.

Richard Sherwood MIOA is a technical advisor with Sound Reduction Systems Ltd

References

- 1. International Standards Organisation Acoustics -** Measurement of sound insulation in buildings and of building elements - Part 18: *Laboratory measurement of sound generated by rainfall on building elements*. British Standard BS EN ISO 140-18:2006.
- 2. Department for Education and Skills Acoustic design of schools.** DfES Building Bulletin 93. London, The Stationery Office, 2004.
- 3. BRE/Carl Hopkins Rain noise from glazed and lightweight roofing.** Information Paper IP 2/06. January 2006.
- 4. Department of Health Specialist Services: Health Technical Memorandum 08-01: Acoustics.** London, The Stationery Office, 2008.

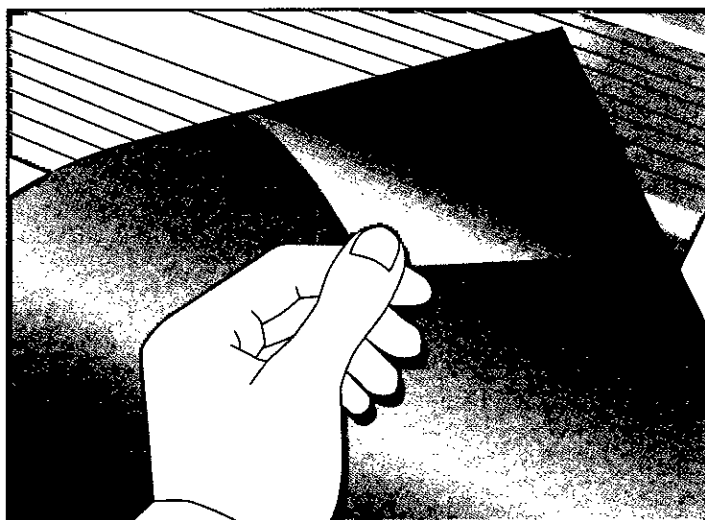


Figure 2

Peel off carrier paper to reveal adhesive ...

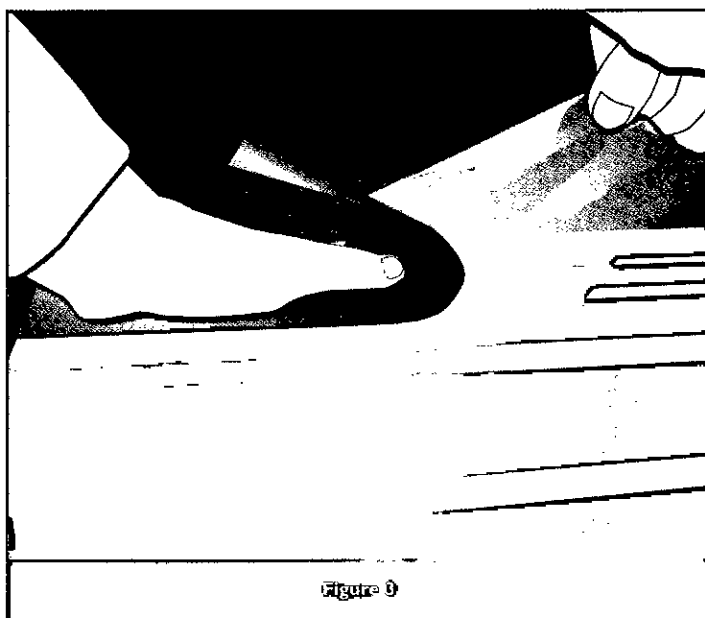


Figure 3

... apply using moderate hand pressure ...

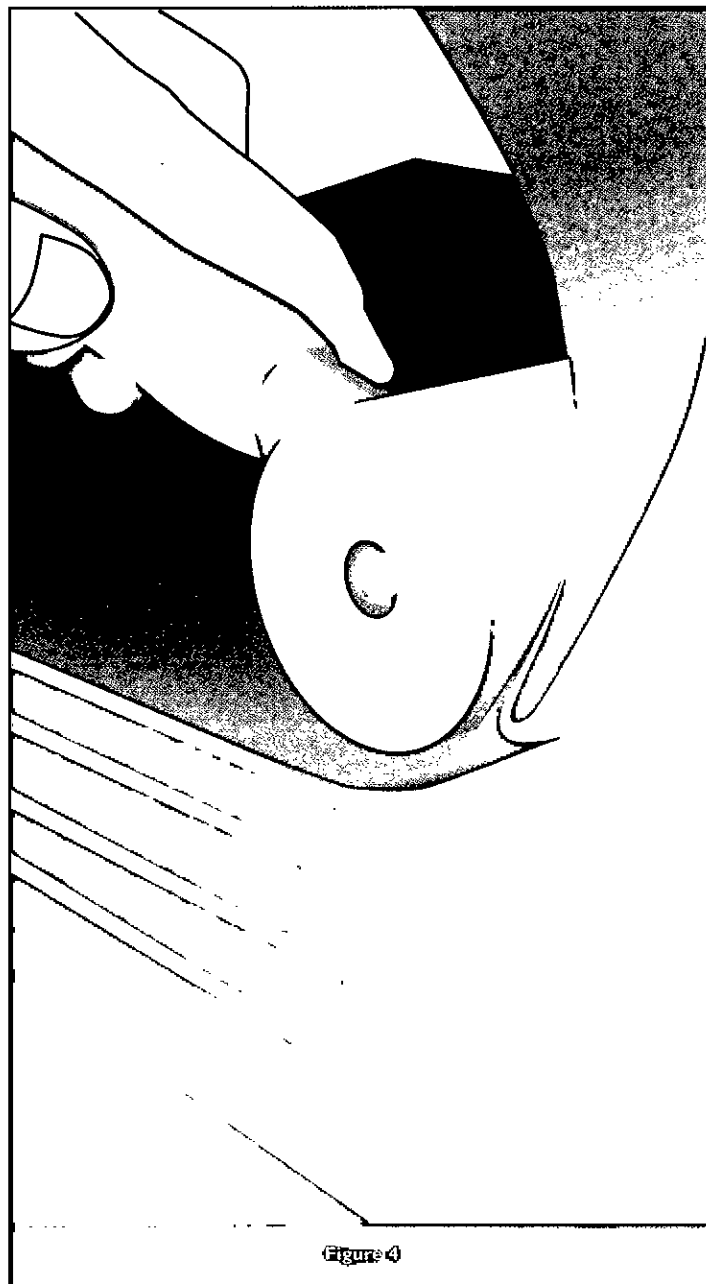


Figure 4

... or a hand roller

Soundspec

launches online building acoustics product directory

A unique online product directory dedicated to building acoustics products and materials has recently launched at www.soundspec.co.uk.

The product directory, developed by acoustic design consultant Alex Taylor, has been designed primarily to assist architects, specifiers and buyers in quickly sourcing a wide range of building products and materials that can meet

their project specific acoustic specifications. The Soundspec website lists building products and materials from over 40 manufacturers and suppliers, along with summary product dimensions and relevant acoustic ratings.

Each listing in the directory is product or system specific and links to a detailed product webpage on the relevant manufacturer's website.

With close to 300 building acoustics and vibration related product links including acoustically rated doorsets, vents, acoustic panels, absorbent ceilings and floating floor treatments, the soundspec directory should also serve as a handy reference tool for acoustical consultants.

The directory can be found at www.soundspec.co.uk

Atkins Acoustics

wins Defra contract

Atkins Acoustics, Noise and Vibration has recently been awarded a contract by Defra to undertake a study of environmental noise valuation, and in particular, a cost and benefits analysis (CBA) of remediation measures.

The work will investigate the practicalities of carrying out CBA assessments of noise mitigation projects, drawing on case studies where this has been done in practice and using the case studies to provide lessons learnt and practical tools

The focus of this research will be on evidence from the UK, however, evidence from other EU Member States will also be reviewed. This will include a summary of the current approaches to valuation of noise in other Member States, the type of research which the valuation was derived from (eg health effects, annoyance measures through hedonic pricing or stated preference means) and any available examples of how this has been applied in practice.

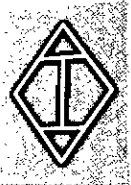
Through the practical lessons, this will allow

for a proportionate CBA of potential remediation measures to be carried out. Practical tools will be developed which will assist at a policy level and at the local authority level, establishing where money may best be allocated to target noise.

This will allow decision-makers to bring in necessary and focused measures and to allocate an appropriate level of resources to implement action plans required under the Environmental Noise Directive and domestic regulations.

We're on the move...

AV Calibration Ltd will still be here for **all** your noise and vibration equipment calibration even though from 6th July we're moving to new premises.



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Website: www.avcalibration.co.uk

Temple Group

Helping Transport for London keep Tube customers cool

Temple Group (www.templegroup.co.uk) with offices within London and Sussex, is one of the partners working with TfL on the Cooling the Tube programme, having secured a contract to provide specialist environmental monitoring on the Victoria Line mid-tunnel ventilation upgrade programme. Temple will be supported by Plowman Craven on this project.

TfL is investing to address the issue of heat on the Tube. Getting heat out of the London Underground network is a huge engineering challenge. TfL has established a dedicated project team to provide solutions to prevent temperatures on deepest parts of the network rising to unacceptable levels.

London Underground's services are planned to increase by 25%, and new trains that can accelerate more quickly are on order. Moving more

customers and more trains takes more energy, even when the best of modern technology is applied, and more energy creates more heat.

Keeping the Tube's customers cool involves developing new technologies, as well as making best use of more traditional approaches. Every effort is being made to ensure that 'green' methods are used wherever practicable.

Temple's brief includes the monitoring of noise, vibration, air quality, dust, strain and movement, at five mid-tunnel ventilation shafts on the Victoria Line before, during and after the installation of new exhaust fans to allowing for a doubling of ventilation capacity. The contract includes the option for four additional sites to be monitored.

Mark Southwood, Temple Group's managing director, commented that his company was



Victoria Line upgrade

delighted to be involved on such a vital infrastructure project for the capital, which built on the success it had already had supporting other clients on major infrastructure projects. The project would require a range of technical competences and state-of-the-art monitoring equipment, as well as effective engagement with TfL and stakeholders alike.

For further information visit Temple's website, www.templegroup.co.uk or contact John Rowland, technical director, on 0207 394 3700, email: john.rowland@templegroup.co.uk

Selectaglaze

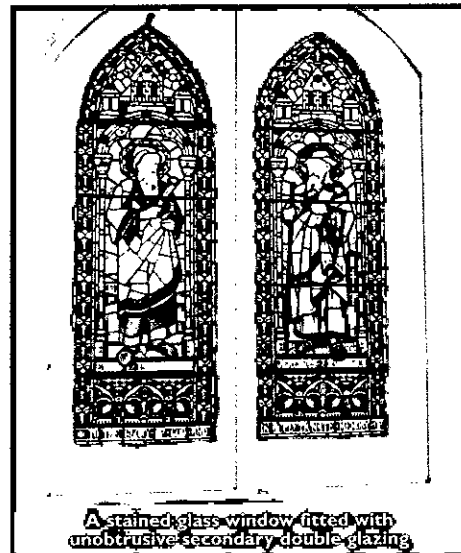
helps church find a new 'congregation'

This summer will see one of London's Grade II* listed churches reborn as part of a state-of-the-art performance centre. In 2006 the 150-year-old Victorian church of St John the Evangelist church was decommissioned by the Diocese of London. However, the governors of the neighbouring Godolphin and Latymer School recognised its potential to play a major part in the development of a much-needed music and drama centre for their pupils, so a 125-year lease was duly agreed.

The Bishop Centre, as it will be known (in memory of Dame Joyce Bishop who was headmistress from 1935 to 1963) can accommodate audiences of up to 800. Balconies at the upper level afford extra seating space and the hydraulic steel deck staging system is modular,

allowing seating to be arranged in 18 different configurations. An orchestra pit, a theatre in the round, catwalk, a stage at either end of the auditorium and raked seating are a few of the options now available to the school, who will also make the facilities available to the local community.

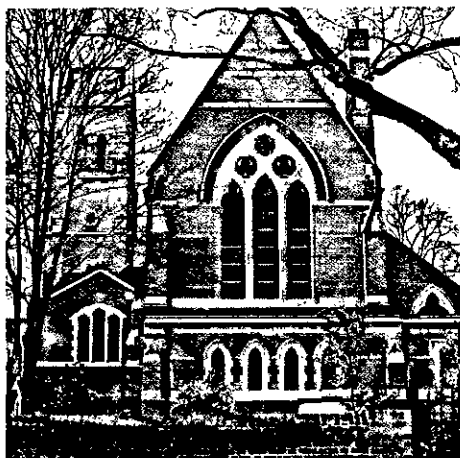
Working closely with architects Burrell, Foley and Fischer, Selectaglaze, the UK-based designers, manufacturers and installers of secondary glazing systems, were tasked with providing units to minimise noise ingress and egress without introducing additional sight lines to the Gothic style windows, particularly the two monumental windows one at each end of the church. The units needed to be subtle and unobtrusive so as to render them almost invisible. Selectaglaze achieved the desired effect with a combination of their Series 10 and 20 horizontal and vertical sliding



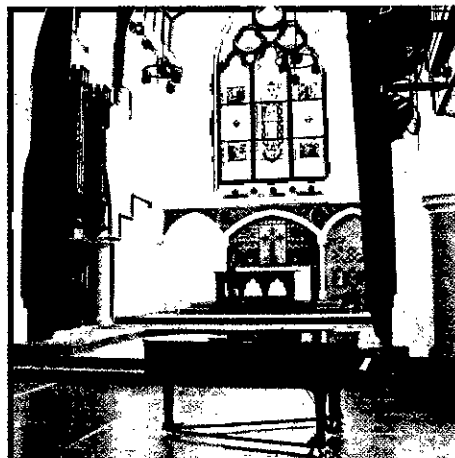
units and Series 46 fixed lights, most of which featured curved heads. A total of 96 units were provided with either white or grey-beige coating, to blend successfully with the building's beautifully restored stone and brickwork.

Founded in 1966 and a royal warrant-holder since 2004, Selectaglaze works extensively within listed buildings and offers a technical and specification advisory service to ensure sympathetic treatment and the correct interface with other trades. Programme timings are particularly important, and proactive site surveys linked to a modern production facility working on 'lean' principles ensure that projects are delivered on schedule.

Selectaglaze has an extensive range of literature including test results for noise insulation, energy efficiency and added security, all of which are free upon request from the marketing department on 01727 837271 or by email from enquiries@selectaglaze.co.uk. The company's comprehensive website is at www.selectaglaze.co.uk.



Exterior view of the new Bishop Centre, an innovative use of a redundant church



The interior has the capacity for several different performance layouts

Book review

Environmental Noise Barriers - A guide to their acoustic and visual design

Benz Kotzen is a chartered landscape architect with over 25 years of experience, and most members will recognise Colin as the Immediate Past President of the Institute of Acoustics. *Environmental Noise Barriers - A guide to their acoustic and visual design* is the updated second edition of their excellent book, originally published in 1999.

As the title suggests, the book provides a comprehensive guide to environmental noise barriers. For the acoustician it provides a thorough discussion of the theory behind the acoustic performance of barriers and explores the many factors that can diminish and enhance the attenuation that they provide. However, the great potential of this book derives from the fact that the authors have collected together an extensive variety of photographic examples of barriers of all types from across the globe, supporting a comprehensive discussion about their design and use of different materials. As the book states, noise is a landscape issue and the many practical and innovative examples within its pages demonstrate that it is possible to improve the noise climate without detracting from the visual landscape, and indeed, careful use of the right design and materials can result in a positive contribution to it. The book should

therefore provide a highly useful source of information, if not inspiration, for architects, planners, developers, engineers and acousticians.

Sadly, like the original edition, the numbers of examples provided from within the UK remains small in comparison to those from throughout the rest of Europe, and this is probably an accurate reflection of the fact that the UK, over the years, has lagged behind its near neighbours in the creative use of environmental noise barriers. It can only be hoped that this will change with the development of noise action plans to meet the requirements of the UK Regulations implementing the Environmental Noise Directive. These noise action plans should present significant opportunities for the use of barriers and screens to tackle noise from transportation sources. The timing of publication of this updated edition could not be better, and it is hoped that the competent authorities, and those implementing the action plans on their behalf, will use the wealth of information contained within its pages and adopt a more positive attitude towards noise barriers.

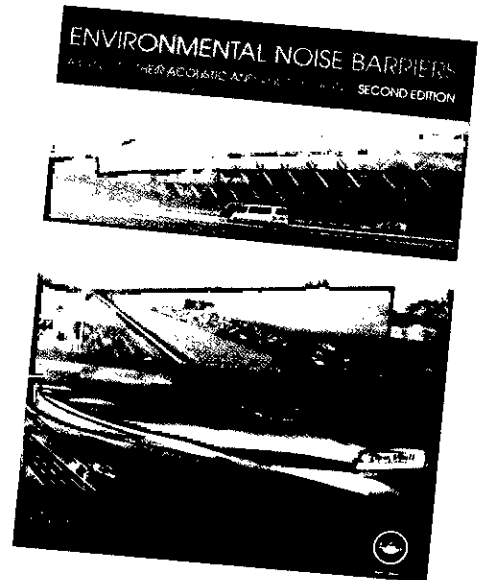
As well as significantly increasing the number of photographs and illustrations the authors have also incorporated into this second edition new chapters on plants for use on barriers and

contemporary issues including wildlife, the use of photovoltaic cells, and the potential for barriers assisting air pollution reduction. Perhaps it is also a sign of the times that there is now also a section devoted to graffiti.

In summary this is a very good book that should prove useful to many.

Tim Clarke MSc MIOA, MCIEH

The views are those of the author and do not represent those of Bristol City Council.



by Benz Kotzen & Colin English,
Spon Press 2009

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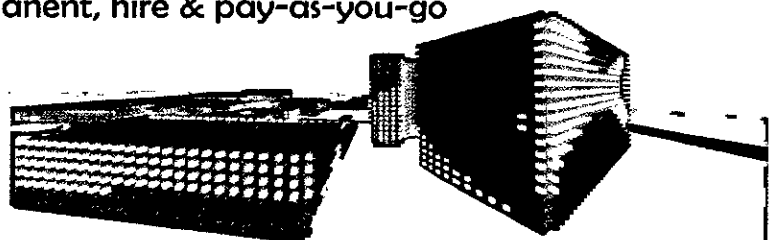
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Fraudulent performance certificates

Diarmuid Keaney. What you see might not be what you get

I saw the recent spotlight on fraud as an insert to *Acoustics Bulletin*, in relation to forged pre-completion testing certification.

I was recently involved in a theatre project in Ireland where I specified acoustic doors with a minimum R_w of 53dB, in an effort to reduce break-in noise for a theatre space. The supplier (a sub-contractor to the main contractor) provided me with certification (very late in the project, despite many requests) only after the doors had actually arrived on site. I was advised that the doors had been shipped from China and that they all had the appropriate and necessary test certification. I was further advised that they had been certified by an Australian noise consultant by the name of Ron Rumble.

The doors had no markings, and there were a number of other differences from the drawings, which made me a little suspicious. I decided it might be best to contact Ron Rumble, whom I found using Google, to see if

he could clarify a few issues. I sent him the test reports I had been given. The response I received from Ron, which is fairly self explanatory, is reproduced below. Since my discovery, the main contractor has been asked to remove all the doors and replace them with doors from a reputable UK supplier.

By means of this letter, I thought it worthwhile making IOA members aware of this kind of practice: I am sure this is not the first case, nor do I expect it to be the last. Ron Rumble has given his enthusiastic support.

Diarmuid Keaney

BEng MIOA MInstSCE, ICAN Acoustics

Phone: Dublin: 01-4403869.

Galway 091-588555

Re: Forged test reports out of Singapore

Dear Diarmuid

I would have no problems with you publishing my memo to you in the (UK) Acoustics Bulletin.

I intend to make a similar announcement in Acoustics Australia which is our national bulletin.

It will, I hope, be a wake-up call to all of us. The ease with which our work can be 'cut-and-pasted' by unscrupulous types would suggest that forgeries of this nature might be more prevalent than we think.

I am glad that you took the time to contact me, rather than to simply write it all off as the work of some crackpot Aussie. I wonder how many other consultants have been given bogus reports using our letterhead, and have abused us retrospectively when they got into trouble when jobs did not work?

I would be happy for you to publish my comments. It might even redeem our reputation in the eyes of those consultants who have been misled.

Regards

Ron Rumble

Revolutionary Reflex

Brüel & Kjær launches intuitive data analysis software: PULSE Reflex

Investigating acoustic and vibration measurements is set to become much easier with Brüel & Kjær's new post-processing software, PULSE Reflex. Designed in close cooperation with the company's customers already using its PULSE data analysis system, within different industry sectors worldwide, the new software consists of three main applications. The first, PULSE Core Time, is a record editing and post-processing analysis tool, which has an efficient and almost limitless time data handling capacity. This allows the user to edit, filter and study acoustic and vibration results taken inside areas such as aircrafts, trains or other vehicle cabins.

The PULSE Reflex Modal Analysis tool operates as a guide for users through measurement validation, parameter estimation setup, mode selection, analysis validation and reporting. The results can be used for troubleshooting, benchmarking and model validation during the construction of road vehicles, ships or aircrafts.

The PULSE Building Acoustics tool provides fast post-analysis of building acoustic measurements recorded on sound level meters. During planning and construction stages, architects and builders may have to meet industry specified noise parameters, including loudness (ISO532B) and Noise Rating (NR). Brüel & Kær's type 2250 and 2270 meters feature these common noise

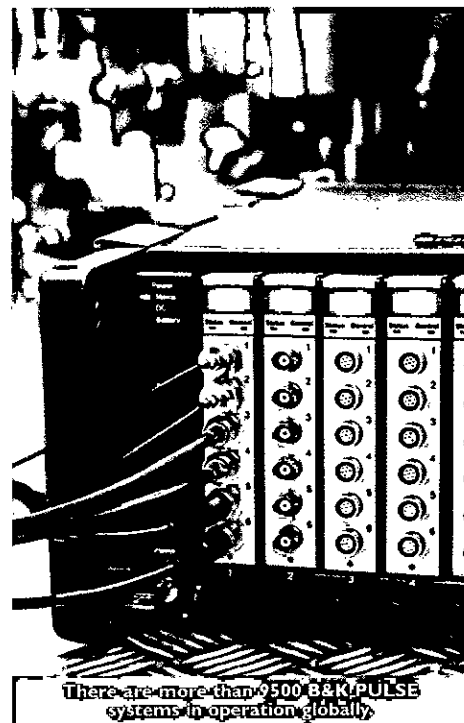
parameters as standard, to ensure users are able to specify the ambient noise levels allowed by the mechanical systems of buildings. Once the field or laboratory sound insulation data has been gathered, the PULSE Building Acoustic software allows the user to measure, review and compare results. The data can also be exported in Microsoft Excel or Word reports.

The software enables fast navigation across large volumes of data, rapid filtering or sorting data for further processing, such as statistical analysis, frequency analysis or modal parameter estimation. Users can also include sounds, photographs or videos, which are then linked to items in the project, to provide handy, visual reminders of how - or why - critical decisions were made.

For more information, please phone (+44) 01438 739000, email heather.wilkins@bksv.com, web site www.bksv.co.uk

Brüel & Kjær also runs a variety of training courses throughout the year, from basic introductions on noise and its effects to more specialised classes teaching customers how to get the most out of their equipment. To see our full training course calendar, visit: <http://www.bksv.co.uk/Courses/Training%20Courses.aspx>

Free, online training courses conducted by our expert engineers run throughout the year too. For registration details and the



latest planned web training sessions, visit: <http://www.bksv.co.uk/Courses/Web%20Courses.aspx>

Brüel & Kjær UK has its own Service Centre which is UKAS accredited to the international standard ISO/IEC 17025, ensuring traceable or accredited calibration for equipment. To book a service or for more information, please contact our service department on 01438 739100 or visit: <http://www.bksv.co.uk/ServiceCalibration/CalibrationService.aspx>

Simple vibrations

Vibration measurement in your pocket, from Castle

The GA2002 from Castle Group Ltd has been designed to make light work of industrial vibration measurements. There are many engineering and maintenance applications where vibration measurements can provide invaluable information on performance and running condition; the Castle GA2002 is perfectly suited to these applications and could not realistically be simpler to use.

Reliable, repeatable and simple are three important attributes most people look for in vibration meters. The GA2002 offers all this and more with the use of the latest technology. The instrument gives all the fundamental vibration measurements and will even store up to nine sets of results for later viewing: this makes it perfect for general

machine and bearing vibration monitoring as well as any other general purpose vibration measurements that may be needed.

The robust accelerometer provides the instrument with the necessary signals to provide acceleration, velocity and displacement parameters in two ranges, with the option of viewing them as rms or peak quantities. Dedicated keys allow quick access to the desired measurement and a single key press will store the current value seen on the screen. The instrument comes with an accelerometer, magnet and spike probe and is available now for delivery either direct from Castle or through the RS catalogue. For more information contact Nola Edwards on 01753 858063 or email nedwards@bulluk.com.



Odeon version 10

New version just announced

Odeon A/S released a new version of the Odeon room acoustical modelling software in June 2009. The new version 10 includes array loudspeakers and diffraction around edges. For more information visit <http://www.odeon.dk/News+in+Odeon>.

In large open spaces one popular solution is

to use array loudspeakers and beam steered arrays. Odeon version 10 makes it possible to model or import the user's own arrays and see how they interact in different rooms. This new functionality makes Odeon the ideal solution for integrating room acoustics and public address system design.

Sound propagation around screens and objects has also now been implemented in Odeon version 10. One and two point diffraction, thin

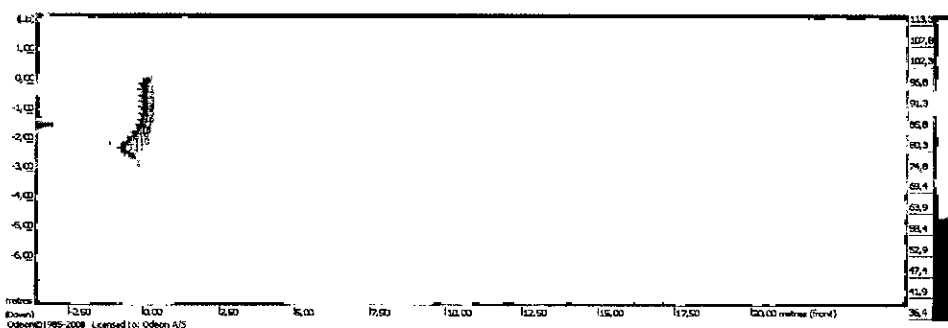


screens, wedges with any opening angle, and thick barriers are all supported by the efficient and accurate diffraction models, originally developed by Allan D Pierce.

External events of interest

29 to 30 October 2009

A two day course in advanced room acoustic modelling with Odeon will be held in Edinburgh. For more information visit <http://www.odeon.dk/advanced-room-acoustic-modelling-odeon>



New Nor133 three-channel vibration meter

and Nor136 six-channel vibration analyser

Norsonic AS has launched the Nor133 and Nor136 multi-channel meters for whole-body and hand-arm vibration measurement, and analysis of machine and structural vibration. Additional measurement capabilities include vibration in buildings, ships, vehicles and public transport systems in accordance to international and national standards (ISO 2631 and ISO 5349).

The Nor133 and Nor136 can be used with

the Nor1038 NorVibraTest PC application programme for detailed analysis of measurements. This option gives the opportunity to assess the same measurement at a later time with any desired weighting functions, for example if standards or criteria should change. In other words, the measurement on a machine or vehicle does not need to be repeated if the standards change. The old raw data can just be analysed

again using the new weighting functions!

- Norsonic AS is a leading manufacturer of noise and vibration instrumentation. See www.norsonic.com for more background information
- CA is the sales and calibration resource for the UK and Eire: see www.campbell-associates.co.uk. CA also has an instrumentation hire operation: see www.acoustic-hire.com

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Members are reminded that only Sponsor Members are entitled to use the IOA logo in their publications, whether paper or electronic (including web pages).

Committee meetings 2009

DAY	DATE	TIME	MEETING
Wednesday	1 July	10.30	CCENM Examiners
Wednesday	1 July	1.30	CCENM Committee
Thursday	2 July	10.30	Engineering Division
Tuesday	7 July	10.30	ASBA Examiners
Tuesday	7 July	1.30	ASBA Committee
Thursday	9 July	10.00	Meetings
Tuesday	4 August	10.30	Diploma Moderators Meeting
Thursday	3 September	10.30	Membership
Thursday	10 September	11.00	Medals & Awards
Thursday	10 September	1.30	Executive
Thursday	17 September	11.00	Publications
Thursday	24 September	11.30	Council
Thursday	1 October	10.30	Diploma Tutors and Examiners
Thursday	1 October	1.30	Education
Thursday	8 October	11.00	Research Co-ordination
Thursday	15 October	10.30	Engineering Division
Thursday	5 November	10.30	Membership
Tuesday	10 November	10.30	ASBA Examiners
Tuesday	10 November	1.30	ASBA Committee
Thursday	12 November	10.00	Meetings
Tuesday	17 November	10.30	CMOHAV Examiners
Tuesday	17 November	1.30	CMOHAV Committee
Thursday	19 November	11.00	Executive
Wednesday	25 November	10.30	CCENM Examiners
Wednesday	25 November	1.30	CCENM Committee
Thursday	26 November	11.00	Publications
Thursday	3 December	11.30	Council
Tuesday	8 December	10.30	CCWPNA Examiners
Tuesday	8 December	1.30	CCWPNA Committee

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.

Meetings Programme 2009

23 June 2009
DID YOU HEAR THAT? –
CONCEPTS OF
AUDIBILITY AND
INAUDIBILITY
The Royal Society, 6-9 Carlton
House Terrace, London SW1Y 5AG

2 July 2009
YOUNG ACOUSTICIANS
SEMINAR
The Arden Hotel, Birmingham

8 July 2009
THE ASSESSMENT AND
MITIGATION OF NOISE
FROM SUSTAINABLE
SOURCES
Barceló Oxford Hotel, Oxford

26-28 October 2009
EURONOISE 2009 -
ACTION ON NOISE
IN EUROPE
EICC, Edinburgh

19-20 November 2009
REPRODUCED SOUND 25 -
THE AUDIO EXPLOSION
The Thistle Hotel, Brighton

29-30 April 2010
Joint conference IOA with ABAV
and supported by EAA
NOISE IN THE BUILT
ENVIRONMENT
Ghent University

24-28 July 2011
Joint conference IOA
with ICBEN
ICBEN 2011
Imperial College, London

Further details
on all conferences
are available on the
IOA website
www.ioa.org.uk

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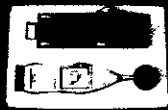
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- Sends Alarms and Data via GPRS (Vibra+)



Data Handling

- You can 'always' get the data from a **RION**
- Data stored as CSV files to Compact Flash
- Specialist download leads/software not needed



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