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LSBU welcomes its first acoustics engineering technician cohort

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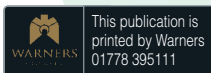
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ACOUSTICS BULLETIN

Acoustics Bulletin Volume 48 No 6 November/December 2022

Cover image: The 51st International Congress and Exposition on Noise Control Engineering (Inter-noise) was held at the Scottish Event Campus (SEC) in Glasgow in August 2022. It is the major international conference on noise control engineering for scientists, engineers and consultants from around the world. Starting on page 22, we bring short reports of a selection of sessions.

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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, electroacoustic, 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



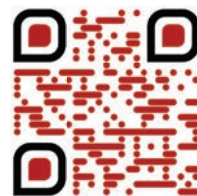
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Dear Member

In my last letter I spent much of the time looking back on the many challenges and achievements of our Institute and its members. I would now like to take the opportunity to look forward to next year and beyond. However, before I do that, a couple of thank yous, and comments on what you will find in the following pages.



Thank you...

Firstly, to Russell Richardson and the ANC for hosting me at their annual conference in Birmingham. This was a most enjoyable event with many excellent presentations and awards for innovative designs and projects. For me, the prize for best intro to a presentation goes to Andrew Jarvis for "Tall towers are on the rise!" This being the first sentence in a paper on the acoustic phenomenon of 'creaking' sounds in tall buildings as they sway in the wind.

Secondly, to the Noise Abatement Society for hosting the John Connell Awards and including in their programme the opportunity for me to present an award to pupils from St Oscar Romero Catholic School, the winners of the 2022 Institute of Acoustics Secondary School Competition. This event encourages young people to explore the wonderful world of acoustics and this year's winners carried out an innovative and thorough investigation into sounds in their school. Focusing on the school bells, they developed sound recording technology from readily available and affordable resources, produced a sound 'heatmap' of the noise impact and recommended mitigation measures. Their website presentation of the findings was outstanding.

This Acoustics Bulletin — inside the covers

- **Acoustics apprenticeships.** The first cohort of apprentices have started at London Southbank University. This has been in the planning for some time and it is great to see it off the ground. Well done to LSBU staff and Richard Grove for getting us to this stage. Although this year's numbers are small, the IOA (in partnership with the ANC) are committed to supporting this initiative and are encouraging the development of further online content in order to widen access to acoustics apprenticeships.
- **Two new IOA report writing courses.** Big thanks go to all those involved in developing these latest additions to our IOA certificated courses, and also to those who have been active in the management committees set up to facilitate their delivery. These courses were developed in response to significant demand and so I hope they will be recognised as a highly valued professional development and training resource in

the future. I'm particularly delighted that one of them is our first offering at advanced certificate level, which I hope will act as a precedent for such courses in other subject areas.

- **Inter-noise22, Glasgow:** If you were at Inter-noise and want to reminisce, or want to see what you missed by not attending, have a look at the post-conference report and feedback.

Looking to the future

Since taking up the position as President Elect, and more recently as President, I have spent a significant amount of time considering what we do, how we do it and the improvements that can be made. Some of you will be aware of this, as I have already sought your views on a wide range of Institute issues and tested out some of my thoughts on you. Many of my meetings have been with those who play a leading role in our Institute and I will continue to schedule in such meetings. The focus for these meetings is to provide an opportunity for open discussion, take onboard feedback and discuss aims and objectives for 2023. If you wish to contribute to these discussions, particularly in terms of the priorities listed below, please feedback through your local branch or directly to ioa@ioa.org.uk using the heading 'Shaping the future'.

In looking to the future, the priority areas I wish to address are:

- improving our processes for managing 'governance' meetings (Council & Committees);
- expanding our sphere of influence in government and public circles;
- developing our support and resourcing of Member Services (membership management/CPD monitoring/defining competencies/Research member considerations/Charter status);
- developing a business plan for managing/expanding/re-shaping our educational services delivery, to include a review of: subject areas, qualification levels, flexibility of study options, and geographic regions served;
- improving our engagement with and influence in international acoustics organisations;
- reviewing our Groups and Branches activities, deliverables and committee demographics; and
- broadening the appeal of IOA membership to under-represented professions, initially focusing on recovering member losses in the areas of academia and regulatory enforcement.

In conclusion, I would like to emphasise that sustainability, equality, diversity and inclusion must provide the underpinning contexts which inform all areas of our deliberations and decision-making.

Alistair Somerville, IOA President

Engineering Division



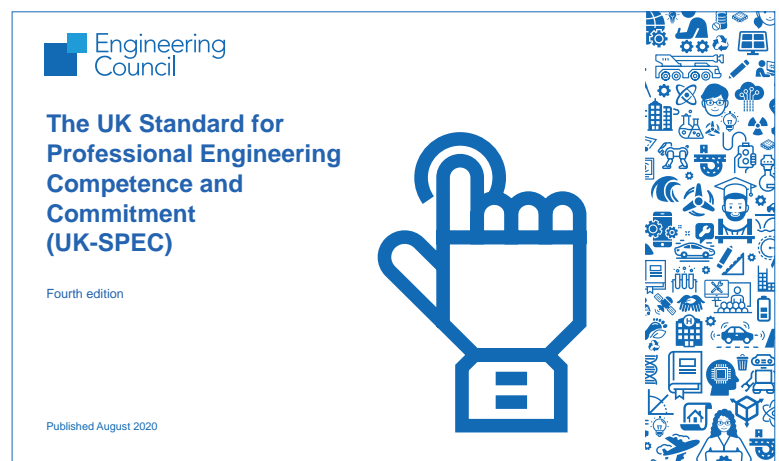
The IOA Engineering Division will support you through the process to help you become one of almost 229,000 registrants that hold international professional recognition.

By Blane Judd BEng FCGI CEng FIET FCIBSE, Engineering Manager

Things have remained slow and once again we only had one candidate ready for interview. There are a couple who were close, but since our mantra is to only to put someone forward for interview who on paper would succeed (we can't control how you perform at the interview stage of course) we have held them over to the next set.

We now have some educational videos on the subject of professional registration and becoming chartered as an acoustics consultant. If you haven't seen them yet, jump onto the website and have a look. James Hill, Chair of the Engineering Division talks a group through the process and answers questions on the subject. There has always been a myth that as a consultant in a small business, chartered status is almost unobtainable. In this video those myths are busted with good practical advice on how to put a submission together. The second video is about the process and also looks to put the record straight for those who do not have degrees or who think it is harder (or easier) to get registration in other professional bodies.

All professional engineering institutions, who hold an Engineering Council license to offer professional registration, work to the same standards and are regulated by the Engineering Council to make sure the process is fair and equitable across all licensed bodies. We are all regularly audited by independent assessors to make sure we comply with the rules and regulations.



Advice and guidance

The process for registration starts with candidates being provided with guidance material when they first apply, and we are always ready to comment on the content of their professional review report prior to them submitting the final draft. We occasionally get applicants who have submitted reports which do not initially address the competencies in UK-SPEC. We will always comment on submissions and ask for re-drafted versions, but to avoid an iterative process, try to include evidence that shows you have the underpinning knowledge related to the projects you have submitted. Make sure that you write in the first person, it is strange for engineers to talk about what "I" have done, as we so often work in teams, but in this instance, it is important to show what your contribution was. For example, if you have selected a particular software to conduct modelling, explain why you chose it, what the shortfalls were, what results you were expecting and how you validated the outputs. Include equations if they are

relevant and cite specific standards that you were working to. This is one occasion where you should not assume that the assessor will know you understand, you need to spell it out. These are all part of the A and B competencies and will save you having to do several rewrites. Also remember that communication is a key competence, so don't pad the report — make sure it is concise and to the point.

Apply the **STAR** principle:

- Explain the **Situation** your project relates to, describe the **Task** you needed to undertake, detail the **Action** you took to deliver the project and finally the **Result** you achieved.

We still get a number of candidates who, once they have paid their invoice, then ask what the next steps are. These are all clearly laid out in the guidance. Please take the time to study it as it will tell you what documents are needed and which items need to be endorsed by your sponsors. It also explains what to do if you cannot find IOA members to act as your sponsors.

Support for all candidates

Following the initial round of housekeeping by Emma Lilliman a few more candidates who have paid their invoices have come forward. It is important to remember that if you started the process before the beginning of this year, you will now need to submit using the Engineering Council UK SPEC version 4 which is available from their website <https://www.engc.org.uk/ukspec>.

We are still asking Neil Ferguson to help us with academic equivalence support for those candidates who do not have recognised qualifications. You can check for yourself if your qualifications meet the required specification by visiting the Engineering Council website <http://www.engc.org.uk/courses>. But please don't panic if your specific qualification is not listed, as we can still help you through the process using individual assessment (see later in the article).

We hold several interview events through the year, depending on the number of candidates we have coming forward for registration. If we get sufficient candidates ready and we can bring enough volunteers together to conduct interviews, we may look at a December interview date. If you are impacted by that we will be in touch.

If you are interested in taking the next step to becoming

a professionally registered engineer, contact us on acousticsengineering@ioa.org.uk sending a copy of your CV and copies of certificates and transcripts of your qualifications. It is important that we have all of your further and higher education certificates, not just your highest attainment.

There are two routes to registration:

The **recognised qualification** route, if you have achieved the required learning outcomes through recognised qualifications in acoustics. Qualifications which provide the required level of knowledge and understanding are for IEng and accredited Bachelor's degree and for CEng an accredited integrated Master's degree or a combination of accredited Bachelor's and Master's degrees (see table below).

The **individual assessment** route, for applicants who do not have the recognised qualifications and who will have an individual assessment of their qualifications and any other relevant learning such as: formal academic programmes, in-employment training and experiential learning self-directed learning. In many instances, it is likely to be a combination of some or all these options.

Remember we are here to help you get through the process and advice and support is offered to every candidate personally.

For **individual assessment**, the Institute accepts several courses from certain academic centres in relevant subjects, such as audio technology, as being equivalent to accredited courses for the purposes of EC registration, without the need for further assessment.

The Institute recognises the IOA Diploma course and the several Master's courses linked to it as providing evidence if you are looking to gain CEng registration. You could also offer a PhD qualification, depending upon the content of the associated taught element. We can also offer support for registration via a 'technical report' route, if you do not have the relevant qualifications to help you demonstrate you are working as a professional engineer in acoustics. If you need to follow the technical route, we will discuss this with you before you embark on that process.

Election process

The election process is overseen by the Institute's Engineering Division Committee, which is made up of volunteers from the membership, to whom we are extremely grateful. They represent the ever-growing number of members holding EC registration. They provide the essential peer review process that affirms that you are at the appropriate level for recognition as an Engineering Council Registered Professional Engineer. ☺

Incorporated Engineer (IEng) One of the following:	Chartered Engineer (CEng) One of the following:
An accredited Bachelor's or honours degree in engineering or technology	An accredited Bachelor's degree with honours in engineering or technology, plus either an appropriate Master's degree or engineering doctorate accredited by a licensee, or appropriate further learning to Master's level*
An accredited Higher National Certificate (HNC) or Higher National Diploma (HND) in engineering or technology started before September 1999	An accredited integrated MEng degree
An HNC or HND started after September 1999 (but before September 2010 in the case of the HNC) or a foundation degree in engineering or technology, plus appropriate further learning to degree level	An accredited Bachelor's degree with honours in engineering or technology started before September 1999
A National Vocational Qualification (NVQ) or Scottish Vocational Qualification (SVQ) at level 4 that has been approved by a licensee, plus appropriate further learning to degree level†	Equivalent qualifications or apprenticeships accredited or approved by a licensee, or at an equivalent level in a relevant national or international qualifications framework†
Equivalent qualifications or apprenticeships accredited or approved by a Licensee, or at an equivalent level in a relevant national or international qualifications framework†	

* See: www.engc.org.uk/ukspec4th for qualification levels and HE reference points.

† For example, UNESCO's International Standard Classification of Education (ISCED) framework.

IOA Events for 2022/3

IOA events 2022

Organised by the Electroacoustics Group
 Reproduced Sound 2022 (Auralisation and Personalisation –
 Beyond Reality)
 15-17 November 2022
 The Bristol Hotel, Bristol
<https://reproducedsound.co.uk/>
<https://www.ioa.org.uk/civcrm/event/info?reset=1&id=698>

IOA events 2023

Organised by the Underwater Acoustics Group
 5th International Conference on Synthetic
 Aperture in Sonar and Radar
 6-8 September 2023
 Villa Marigola, Italy
<https://www.ioa.org.uk/civcrm/event/info?reset=1&id=718>

11th International Conference on Auditorium Acoustics
 28-30 September 2023
 SNFCC, Athens Greece
<https://auditorium2023.org>

Acoustics 2023

Institute of Acoustics Annual Conference, Exhibition and Dinner
 16-17 October 2023
 The Guildhall, Winchester
<https://www.ioa.org.uk/civcrm/event/info?reset=1&id=750>

Other events 2023

NOVEM 2021 (Noise and Vibration: Emerging Methods)
 Now 10-12 January 2023
 Auckland, New Zealand
www.novem2021.ac.nz

Acoustics 2023

International Convention Centre Sydney (ICC Sydney)
 4-8 December 2023
<https://acoustics23sydney.org/>

For up-to-date information visit www.ioa.org.uk

REPRODUCED SOUND 2022 Buddy Scheme

The IOA, Early Careers Group and the Equality, Diversity and Inclusion Working Group are putting together a Buddy Scheme for Reproduced Sound 2022.

The scheme is to enable people who are not confident about attending the conference (buddies) to have a point of contact (mentor) throughout the conference.

Each mentor will be grouped with two buddies. Where possible buddies and mentors will be grouped according to specialist acoustic interests, if desired. Registration details for buddies and mentors are available on the website.

For more information, please visit:
<https://bit.ly/RSbuddyscheme>

FOR MORE INFORMATION:

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New short courses on report writing

The IOA offers professionally recognised courses for those interested in working in any aspect of acoustics.

By Professor Keith Attenborough, IOA Education Manager



Advanced Certificate of Proficiency in Technical Report Evaluation (ACPTRE)

This course aims to provide the skill set involved in criticising and evaluating technical reports in acoustics. While the course is appropriate for a wide audience it is aimed primarily at those in senior positions in acoustics and in science and engineering consultancies, in pollution control and environmental health practices and anywhere that assessment of technical reports is important.

The course assumes several years' experience of working in acoustics and familiarity with relevant acoustics terminology and concepts.

Like CPTRW, this course is delivered at an accredited centre over two days. This will be followed after at least four weeks by an online viva and feedback session which could last between 30 and 45 minutes, based on a submitted critical review of an example report in building acoustics, environmental noise assessment or occupational acoustics.

The delivery and quality control of these courses is overseen by a management committee chaired by Dave Clarke of SRL. The first delivery of ACPTRE is expected to be late 2023. 🌐

IOA members may be aware of the portfolio of professionally recognised short courses offered by the Institute for those interested working in many aspects of acoustics. They cover both general principles and specific applications, including:

- building acoustics;
- the management, regulation and control of noise and vibration in the workplace; and
- the measurement of environmental noise such as noise from industrial plant.

The purpose of this article is to bring IOA members' attention to two new additions to the portfolio about writing and critiquing acoustics-related technical reports.

Certificate of Proficiency in Technical Report Writing (CPTRW)

This course aims to provide guidance on effective communication through good technical report writing. The course describes various approaches to structuring reports, provides a detailed overview of what the relevant sections would normally

contain and emphasises the importance of presentation skills.

The course is intended for early career employees in acoustics but the more generic content should be useful anywhere that technical reporting is important, for example, in science and engineering consultancies and in pollution control and environmental health practice.

The course is delivered over two days at an accredited centre. At the end of these two days, candidates are provided with a background brief and associated dataset for a case study in environmental acoustics, building acoustics or occupational acoustics, on which they will be expected to compile and submit a concise technical report. This report will then be assessed through an online viva and feedback session, which could last between 30 and 45 minutes and will take place at least four weeks after the course.

KP Acoustics Research Labs plan to pioneer the first presentation of this course in February 2023. For more details email Education@ioa.org.uk or Professor Chris Barlow at cb@kpacoustics.com.

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Women in engineering

As Chair of the EDI (Equality, Diversity and Inclusion) Working Group, and a woman working in the field of acoustics, I wanted to bring some examples of brilliant women who work in this diverse and dynamic profession to the attention of our members.

By Angela Lamacraft



International Women in Engineering Day (INWED) took place back in June 2022, so following that, we started to profile some of the women engineers working in acoustics in the magazine. We will publish more of them in subsequent issues of *Acoustics Bulletin*, but for now, we introduce Neha Sharma, an acoustics engineer at Hoare Lea, she has a bachelor's degree in mechanical engineering and is currently working towards a PhD in acoustics at the University of Salford.

Neha said: "I got a chance to work as a Knowledge Transfer Partnership Associate with different universities in active collaboration with industry partners to drive Acoustic Product Development and Materials Engineering.

Above:
Neha Sharma

"With more than four years of experience in research and business development under my belt, I now work at Hoare Lea, London, as an acoustics engineer. This gives me an opportunity to explore and contribute to a variety of projects, at film studios, music venues, in the middle of fields, atop majestic buildings, at world class universities, and, my all-time favourite, being at a football stadium watching a match from one of the best seats (a perfect example of mixing business with pleasure).

"To me, acoustics is a field where art meets science. One can very well appreciate how the best of both the worlds of music and physics blend perfectly to connect with one of our five senses.

"As an acoustician, I work on a variety of aspects associated with communicating how our sonic ambience affects us. On some days, I may be measuring sound from local surroundings of a site, while on others I am post processing the acquired data and computationally modelling these spaces I have visited to obtain meaningful information.

"I have plenty of discussions with clients, architects and fellow acousticians to help develop my understanding in the field. I also get to attend conferences, workshops, and training sessions to enhance my knowledge and keep up with the latest trends in the industry. My contribution to our winning innovative idea towards Pollinate 2022, a Hoare Lea led in-house research and development competition, has provided me with an opportunity to

work on cutting-edge sustainable acoustic research alongside my senior colleagues.

"What I absolutely love about being an acoustic engineer is the ability to take important decisions and steer projects to a successful stage every day. This brings me immense joy as it places me in a position of authority, or power, although what they say is true, with power comes responsibility!

New challenges

"I often try to relate how Isaac Asimov puts it when he says '*Science can amuse and fascinate us all, but it is engineering that changes the world.*' As an engineer, I have always had the urge to create and contribute to society, shaping it to be fit for future. In my present position, I feel passionate about taking up new challenges that help reduce the nuisance caused by noise so that we can all enjoy the goodness of sound, retain the music of nature, and let society live life in peace and harmony.

"My fundamental approach to life is to believe in oneself, follow own ears (instincts) and keep one's interests alive. There is a huge difference between 'success' and 'satisfaction', both bearing different end results.

"So, we need to choose and tread the path that resonates the best with ourselves." 🧠

Turn to page 14 to read a profile of a second Salford graduate, Jess Wright.

Environmental Monitoring

The **SV 307A** is designed for long-term and short-term noise monitoring applications such as road and rail traffic, industrial plants or construction sites.

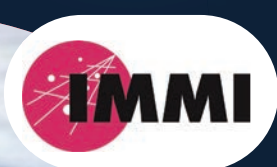
The station firmware has the functionality of advanced triggers that supports unattended measurements. A unique feature of the SV 307A Class 1 sound level meter is it can be calibrated remotely on site saving you time. The SV 307A is based on patented MEMS microphone technology covered by a lifetime warranty.

SV 307A



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by working **with the best**



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30 years of service, product development and work in standards committees speaks for itself.

Women in engineering

In our second women in engineering profile for this issue, we meet Jess Wright, also a graduate from Salford University. She now works at Sandy Brown as a senior engineer.

By Angela Lamacraft



“I believe that the industry as a whole would greatly benefit from a more diverse workforce”

“During my career so far, I have had the opportunity to work on a variety of different types of projects, from apartment blocks to schools and offices to a new stand at my favourite football stadium, Anfield.

“Acoustic consultancy has the benefit of being a part of lots of different projects at once, so my work is very varied, which is what I enjoy the most. From getting out on site testing and carrying out inspections, to design work in the office, writing up reports, putting together calculations and acoustic models. Days are rarely the same.”

Minority

“Right from my time at school and now during my career, I have been in the minority as a woman

in engineering. This was initially as one of only a handful of women studying physics A Level, to being one of a few women on my university course, to now working in acoustic consultancy, which seems to be predominantly a male industry.

“This can be difficult at times, as I have had instances that I’m sure many others have also had, in the wider industry, where I have not been taken as seriously as I think one of my male counterparts would have been. I believe that the industry as a whole would benefit from a more diverse workforce, bringing in new ideas from different perspectives, and that encouraging more women to get into engineering is a vital step forward.”

Jess discovered acoustics when looking at university courses at secondary school. She had a passion for music and was also interested in maths and physics, so it seemed to be the perfect discipline to study incorporating all three subjects.

Jess said: “I graduated from Salford University with a degree in audio acoustics: acoustic engineering in 2018 and first started working for Sandy Brown while I was studying as an industrial placement student in London in 2016. I continued working part-time in the Manchester office as I finished my degree and never looked back! I was promoted to senior engineer last year.

Above:
Jess Wright

If you’d like to contribute to our women’s showcase, please get in touch with us by email at diversity@ioa.org.uk

International Women in Engineering Day began in the UK in 2014 as a national campaign from the Women’s Engineering Society. Since then, it has grown, receiving UNESCO patronage in 2016 and going global the following year. National Women in Engineering Day was launched for the first time in the UK on 23 June 2014 by the Women’s Engineering Society (WES) to celebrate its 95th anniversary.



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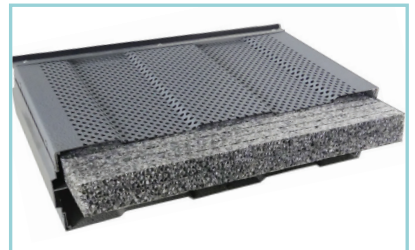
Whisper® NB is a honeycomb-like matrix of networked closed cells which efficiently absorb noise, even in challenging external environments. Flat parallel slots boost absorption at critical rail/road frequencies, providing the material with category A3 absorption whether inside a cassette, or installed as a cladding to reflective noise barrier walls.

Acoustic Properties Whisper® NBO

Sound absorption street DL_{α}	EN 1793-1	dB	9 dB without steel post cladding; 9 dB with steel post cladding
Sound absorption rail DL_{α}	EN 16272-1	dB	11 dB without steel post cladding; 12 dB with steel post cladding
Sound reflection DL_{Ri} in-situ street	EN 1793-5	dB	5
Sound reflection DL_{Ri} in-situ rail	EN 16272-3-2	dB	6

Mechanical Properties

Resistance to frost and de-icing salt	EN 14474	-	Fulfilled
Fire resistance	EN 1794-2	-	Class 1
Notch test	EN 1794-2	-	Class 2
Impact of stones	EN 1794-1	-	Fulfilled
Sustainability	EN 14389-1-2		Acoustic and non-acoustic properties 50 years EPD on request



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FIND OUT MORE

Autonomous robots for sonic inspection of buried pipes

Sonic (audio and ultrasonic) sensing deployed on autonomous robots will revolutionise the way the one million kilometres of buried water pipe network in the UK is inspected and managed.

By Kirill V. Horoshenkov, Professor of Acoustics, Department of Mechanical Engineering, University of Sheffield

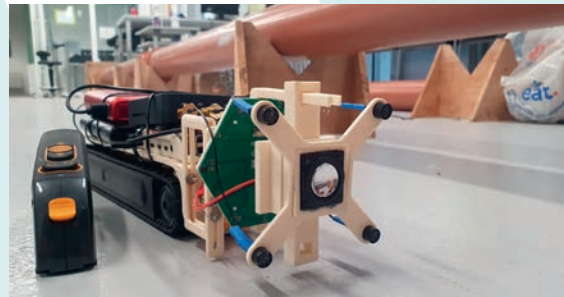


The replacement value of UK buried water and wastewater pipes, a network with a length of approximately 1M km, is between £300bn and £600bn. None of these pipes are smart and their inspection is slow, labour-intensive and subjective. A lack of knowledge about the condition of buried pipes results in sporadic, unforeseen failures. Locating and repairing these faults causes huge disruption to road traffic, pedestrians and local businesses.

As a result, there are around 1.5m road excavations per year in the UK causing full or partial road closures and an estimated loss in earnings to the UK of £5.5bn per year. The actual problem of failing buried pipes is global and its solution requires a step-change in the existing inspection technologies.

Solution

In response to this problem the UK Government invested in a new Engineering and Physical Sciences Research Council (EPSRC) research programme (Pipebots) to develop micro-robots and new sonic pipe inspection technologies that can be used to detect the onset of small defects. A consortium of four



Above left: Figure 1: Professor Kirill Horoshenkov (University of Sheffield) and Dr Thanh-Luan Nguyen (University of Leeds) demonstrating autonomous miniature robots working collaboratively in a wet pipe

Above right: Figure 2: A microphone and ultrasonic transducer arrays deployed on a commercial Looj robot for experiments with the sonic in-pipe inspection technology in the iCAIR facility at Sheffield (www.icair.ac.uk)

universities was formed in 2019 to come up with underpinning science and technology by 2025. This research is led by Professor Kirill Horoshenkov at the University of Sheffield and supported by the University of Bristol (Professor Bruce Drinkwater: sonic sensing), University of Leeds (Professor Robert Richardson: robotics) and University of Birmingham (Professor Chris Rogers: new systems, governance and regulators).

A key idea here is that sonic waves can propagate long distances in clean and wastewater pipes reflecting from any artefacts such as hydrants, junctions, structural defects and blockages. Acoustic noise produced by leaking pipes is not confined to the vicinity of the leak but propagates relatively long distances; carrying information about the leak location and severity. Sonic waves are relatively easy to generate, sense and to process by a team of miniature autonomous robots that are small enough not to cause any problems to the water flow if they fail or run out of power.

The research team has developed a range of new miniature robots that can deploy microphones, piezo-ceramic sensors, accelerometers and sources of sound energy in range of pipes (see Figure 1). These robots are programmed to work autonomously to move through the pipe smartly to

collect acoustic data at a plurality of positions. In clean water pipes key data collected are noise produced by a leak or changes in the pipe wall integrity. In wastewater pipes key data are the topography of the pipe network, location of manholes, joints and lateral connections, root intrusions and onset of blockages.

Audio frequencies can be used by cooperative robots to map the whole pipe network, navigate robots through it and to detect remotely any anomalies which can then be examined with ultrasonic waves at a close range (see Figure 2). Acoustic noise from very small leaks undetectable with commercially available acoustic loggers can be detected with a plurality of sonic sensors that autonomous robots can deploy in the pipe at a range enabling detection.

Communication is another application of sonic waves because radio waves in buried pipes attenuate far too quickly to be of any practical use. On the contrary, audio waves can propagate hundreds of meters in clean water and wastewater pipes carrying messages about critical in-pipe defects and robot's operational status.

Resources

The Pipebots team maintains a live website (www.pipebots.ac.uk) that lists key research publications (<https://pipebots.ac.uk/publications>), news and events (<https://pipebots.ac.uk/news-events>) and describes the roles of the individual team members (<https://pipebots.ac.uk/team>). The team is open to collaboration with wider research and non-academic communities. For more information about this research programme write to pipebots-info@sheffield.ac.uk or k.horoshenkov@sheffield.ac.uk. ©

Approved Membership Applications

The Membership Committee reviewed 53 application forms on 11 August 2022 at their meeting held at the IOA HQ as well 16 through the fast-track route for non-corporate applications. 20 corporate applications have recently been approved by the Council following the recommendations of the Membership Committee. 20 new members have joined the IOA, the remaining are members who have upgraded.

FIOA		TechIOA	
Rhys Owen	Russell Richardson	Archie Byard	
MIOA		Affiliate	
Jonathan Barnard	Miriam Pratap	Lucas Antippa	Jules Marrison
Liam Bryan	Oskar Przybylski	David Bowen	Liam McAleavey
Mark Dring	Jack Rostron	Ian Bull	Alex Metcalfe
Suzy Everett	Ben Symons	Ka Chuen Chan	Akash Naveen Chander
Tony James	Hilton Po-Lai TAM	Douglas Doherty	Mathew Norris
Jonathan Maguire	Jose Tejin	Michael Doward	Timothy Potter
Joe McCall	Raquel Villasante	Reiley Hampson	Jackie Smith
Alasdair McKean	Adam Walker	Wesley Highton	Jodi Smith
Richard O'Sullivan	Xuqian Yang	Grace Kassimoto	Patrick Spiers
		Tak Chun Leung	Stephen Whitbread
		Elizabeth Logan	William Zhu
		Judith MacKay	
AMIOA			
Feroz Ahmed	Julez Redding		
Sonny Calma	Edward Rowland		
Nicholas Conceicao	Lucas Sewsanker		
Jonathan Dance	Samuel Toone		
Saranya Meloth C	Alan Wood Martinez		
Edward Lawrence			

IOA Medals and Awards 2022

The Medals and Awards Committee are pleased to announce the recipients of the following awards for 2022:

Rayleigh Medal
Jian Kang

A B Wood Medal
Sophie Nedelec

IOA Engineering Medal
Dick Bowdler

Peter Barnett Memorial Award
Glenn Leembruggen

Bob Peters Education Award
Keith Attenborough

Promoting Acoustics to the Public
Matt Muirhead



The IOA annually honours people whose contributions to acoustics or to the Institute have been particularly noteworthy. The medals and awards programme has evolved over the years and is now quite wide ranging in its acknowledgment of academic achievement, practical engineering applications and innovations, student achievement and contributions to the Institute and to the world of science and technology. www.ioa.org.uk/about-us/awards

The IOA Diploma in Acoustics and Noise Control

The IOA's graduate entry Diploma in Acoustics and Noise Control has been running since 1975. It is usually studied on a part-time basis over one year. In this article, Kapil Thirwani, Principal at Munro Acoustics India, Mumbai and Bengaluru, India, includes comments from three local graduates who he supported as they studied.

By Kapil Thirwani



Above Below: Professor Keith Attenborough introduces the IOA Diploma in Acoustics and Noise Control

learning course and the week-long lab sessions in DARL, Dubai.

I have been helping students and professionals in the Indian subcontinent that have been interested in the subjects of acoustics and vibration, and here, we profile a few of the recent Diploma graduates:

Saranya Meloth, acoustic consultant, WSP

The IOA Diploma course has been a life-changing experience for me in a good way. It has educated me beyond my expectations and opened up opportunities for me in the acoustics world. When I started the course, I was bit concerned because it was via distance learning but the structured curriculum and the tutors made it very easy. The course syllabus and materials were very detailed, covering all possible topics. The highlight for me was the one-week long lab class part that helped me learn the way acoustic measurements are taken and analysed. I would like to thank all my tutors and the IOA for providing guidance throughout the course and I would recommend it for all people who are considering a career in acoustics.

Uchita Jhaveri, architect

As an architect and acoustical consultant, I wanted to study more about sound travel and its behaviour, sound measurement and its assessment for various environments, its mitigation methods and its effect on humans. The IOA's Diploma in Acoustics and Noise Control covered all these **P20**

The pandemic affected everyone at different levels. There have been radical changes in the way people lead their lives at home and at work. During lockdown there were reports from various sources that people could actually enjoy hearing birds sing as the sounds of nature were no longer drowned by traffic noise.

For a noisy country like India this tranquil environment was due to the absence of noise. Reports from government agencies on studies undertaken in noisy industrial towns like Kanpur and Mumbai revealed a drop of between six and 10 dB.

The economic growth rate of India just after the lockdown surpassed most developing countries due to internal consumption and heightened exports. We know the boom in infrastructure, construction and entertainment began in the late 1990s and early 2000s and peaked in the third quarter of 2020.

Local governments have started new plans to curtail noise

pollution and have undertaken environmental acoustics monitoring with the aim of mitigating excess noise and vibration. For example, Mumbai has turned the noisiest traffic junctions into 'honk-free' zones, issuing massive fines to offenders. Additionally, local government bodies overseeing construction activities have issued new requirements to developers to install façade noise barriers.

Supporting Diploma students

Over the years, the IOA's graduate entry distance learning Diploma in Acoustics and Noise Control has become well established as it provides high level training in real-world practical acoustics. As a result, the Diploma is widely recognised as the leading specialist qualification for the professional practitioner in acoustics. For the past six years we have had an upward trend of applications for the course. After the technical screening of applications 90% of these applicants opt for the distance



experts in acoustics for industrial applications

Whether it's reducing dangerous noise to meet **Control of Noise at Work Regulations** or ensuring noise pollution falls within the **Pollution Prevention and Control Regulations**, CMS Danskin Acoustics have the products, knowledge and experience, from offshore platforms to power stations, oil refineries to cement mills.

Damping Sheet

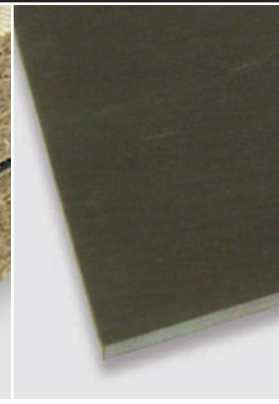
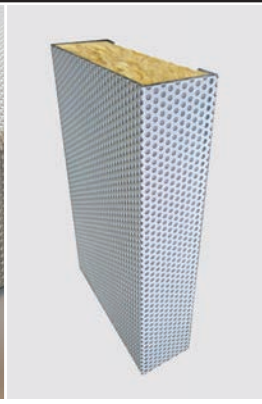
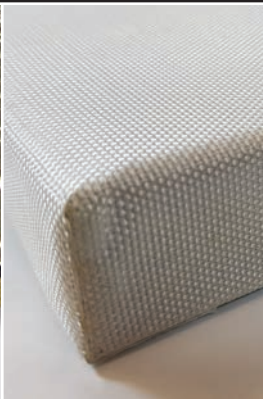
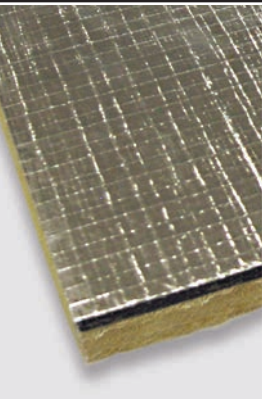
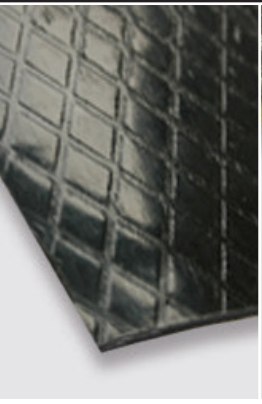
SuperLag

Plant Room
Wall Lining Panels

SuperPhon Hardface

Quietslab Laminate

WB Barrier



aspects and, for me, it was a great learning experience which covered many additional topics related to sound via assignments, projects and laboratory sessions. It also covered regulations and guidelines related to sound control and its impact on humans. The IOA staff were always on hand to offer guidance for any queries or difficulties. I would like to thank Kapil for introducing me to this course, which enhanced my knowledge and understanding of acoustics.

E K Ullas

The IOA Diploma course has been a very valuable learning experience for me. Course materials were very informative, the mentoring approach was excellent and the online education portal was superb. It was an excellent training experience in online classrooms so I never felt it was a distance education programme. The course is designed in such a manner that acoustic learning was not limited to any extent and I gained a lot of knowledge through the course. The assignments helped students

to think outside-the-box and clarify thoughts accordingly. The acoustic lab practical sessions provided a great chance to learn about acoustic measurement in a way that it is used in a professional acoustician's daily life. The IOA diploma course significantly exceeded my expectations.

About the IOA Diploma

Since the IOA Diploma began in 1975 more than 2,000 candidates have been successful and have gone on to become corporate members of the Institute. The Diploma is offered currently at

six Higher Education Institutions in the UK and through tutored distance learning supported by extensive course materials. A lab was launched in the Middle East in 2018 (<https://www.ioa.org.uk/news/new-venue-diploma-laboratory-classes-middle-east>) although students can also access the Dublin lab for the practical component. The IOA Diploma has been offered via distance learning for many years, however in September 2020 a new blended programme was launched with enhanced distance learning content to help support students taking the programme. ©

For more information about the Diploma for international students, email education@ioa.org.uk The next intake will be for the September 2023 cohort and interested students are welcome to contact Kapil for an informal chat, email: kapil.thirwani@ioa.org.uk

For an overview of the Diploma, watch this three-minute video presented by Professor Keith Attenborough <https://youtu.be/gaBIXikugqQ> or watch the full version at <https://youtu.be/O1PjOQWrmzA>



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Want a qualification that assures you of good job prospects?

The one year Diploma in Acoustics and Noise Control includes the General Principles of Acoustics, Laboratory and Experimental Methods, a project and two specialist modules chosen from:

- Building Acoustics
- Regulation and Assessment of Noise
- Environmental Noise: Measurement, Prediction and Control
- Noise and Vibration Control Engineering

Established for more than 40 years, the Institute provides graduates and those with a proven interest in acoustics, the chance to become a recognised member of a vibrant and active global network with regular UK meetings and CPD.

The Diploma is taught in centres across the UK or through distance learning with live tutorials – find out more: www.ioa.org.uk/education-training

FOR MORE INFORMATION:

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Sound Masking

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Cellular offices achieve better speech privacy with Sound Masking

Sound Masking is a cost effective solution to the problem of improving speech privacy in today's modern office environment. Best installed during office fit out but often installed as retrofit, Sound Masking from AET has improved the office environment for many international companies throughout Europe over the last 20 years.

In today's office speech privacy becomes a key aim and open plan offices can suffer from two speech problems:

- Other people's conversations can be an irritating distraction
- Confidential conversations can be almost impossible to conduct

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Sound Masking is also known as sound conditioning or white noise systems



Certificate Number 130222

Inter-noise 2022 reports

The 51st International Congress and Exposition on Noise Control Engineering (Inter-noise) was held at the Scottish Event Campus (SEC) in Glasgow in August 2022. It is the major international conference on noise control engineering for scientists, engineers and consultants from around the world. Here, we bring short reports of a selection of sessions.

The Congress was organised by the IOA and UKAN on behalf of the International Institute of Noise Control Engineering (I-INCE) and it achieved several firsts in international acoustics conference organisation, including:

- the first post-Covid conference to attract nearly 1,000 delegates in-person;
- in addition 300 delegates attended and presented papers online;
- nearly 60 countries were represented;
- 93 registrations from Pan-America, 284 from Asia-Pacific and 849 from Europe-Africa;
- 35% of delegates were research students or early-career professionals; the highest percentage of young people attending an international acoustics conference to date;
- significant industrial sponsorship with more than 45 exhibitors;
- 800 technical papers were presented on 19 main topics, ranging from aircraft noise to underwater acoustics. Two new themes were included: 'Noise control in a more sustainable future' and 'Profession, training and outreach';
- the technical papers were presented in more than 100 sessions, in 15 parallel session rooms, over three days;
- the conference was paperless; delegates were able to access the conference timetable and all written papers on computer and through the conference App;
- all paper presentations were recorded and made available to delegates after the conference, for a period of two months;
- the opening and closing ceremonies and the six keynote presentations, were live-streamed to all delegates, including those online;

- selected technical sessions from each of the main topics, also were live-streamed;
- the technical programme was supported by workshops and social events; and
- the post-conference survey showed an 85% satisfaction rate.

Sessions reports

Early Careers Group

By Tom Galikowski, Ashley Leiper, Angela Lamacraft and Peter Rogers
The IOA Early Careers Group (ECG) and UKAN+ Early Careers Special Interest Group (referred below as IN22 ECG) had been tasked with providing an attractive and engaging programme for early careers researchers, engineers and consultants. This was achieved by providing a mixture of social and satellite events, along with structured educational sessions forming part of the Profession, Education and Outreach stream.

On the first day of the regular conference programme, the IN22 ECG greeted the early career attendees with a breakfast social. The event attracted over 150 delegates who connected with other people, professionals and mentors over coffee and pastries. The event was possible thanks to the generous support of the UK Acoustic Network (UKAN+).

The professional development sessions introduced non-technical topics frequently encountered by researchers and practitioners alike throughout their career. The invited speakers drew on their invaluable experience and knowledge to present topics comprising technical report writing and evaluation (Stephen Turner), uncertainties (Professor David Waddington), team working and communication (Professor Lily Wang), getting published (Professor Li Cheng), grant writing (Professor Patricia Davies)

Below:
ECG breakfast meeting



and ethics (Professor Robert Bernhard). A well-attended career Q&A expanded on these topics and a panel discussion on *Making mistakes and learning from them* sparked an interesting debate about the role that errors play in one's career.



Following the first day of the conference, the ECG in collaboration with the IOA Scottish Branch invited delegates to a joint social event at Platform, a venue located in old railway arches underneath Glasgow Central station. The delegates enjoyed a relaxing evening sharing stories from the first day of the conference over drinks and nibbles, with one of the top Glasgow buskers, Gordon Airlie, providing a fantastic musical backdrop. The event was kindly sponsored by Pliteq UK (the IN22 Early Careers sponsor), Ecophon (welcome drinks sponsor), Campbell Associate (entertainment sponsor) and ANV, Mason UK and New Acoustics (venue sponsors).



Above: Glasgow busker, Gordon Airlie, at the social event at Platform

The Measurement and Methods Workshop took place on the last day of the conference and provided an introduction to the use of various complex and innovative measurement systems. The 40-min long sessions focused on a practical overview of the technologies comprising microphone arrays (presented by Fabio Cassagrande and Miguel Pedroche), the use of virtual reality in acoustics (Roalt Aalmoes), psychoacoustic measurements (Miguel Pedroche), and synchronisation in multi-sensory measurements (Tyler Dare).

The IOA Early Careers was also one of the coordinators of the Buddy Scheme, see page 24 for more information. [P24](#)

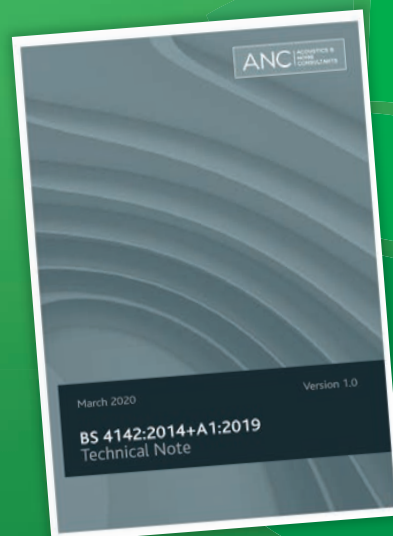
BS 4142 Workshop

Thursday 1 December 2022
15 Hatfields, London SE1 8DJ

Programme for the day is as follows:

- Potential uses of the Standard
- The ANC Technical Note
- The BS 4142 assessment approach looking at case studies and examples
- Summary and discussion

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The ECG also cooperated with Arup and BBC to provide organised tours of Arup's SoundLab and BBC studios located near the conference venue. The SoundLab tours included demos of some projects where innovative tools were used to help solve challenging problems. The BBC Pacific Quay studio tours allowed the delegates to see inside of a broadcast building and consider the technical acoustic and audio challenges in making such a complex building a success.

The Early Careers programme during the conference was popular with the attendees and we hope that it provided many opportunities to learn and connect with other conference guests.

The IOA's first Buddy Scheme

By Angela Lamacraft (IOA Diversity

Champion and Chair of the EDI

Working Group), dBx Acoustics Ltd

Think back to your first conference, you were probably at least a little bit nervous, especially if you were the only person from your place of work there. Wouldn't you have loved to have known at least one person in that room before you went in? That was the motivation for the IOA's first Buddy Scheme, which was organised by the EDI Working Group and Early Careers Group for Inter-noise 2022. It was hoped that people who were not confident about attending would be more encouraged to sign up to the conference if they were part of the Buddy Scheme and, hopefully, get more out of the experience of attending the event. The Scheme also helped participants to meet other attendees of the conference, as well as a few of the leaders of the IOA, with their mentor there to introduce them.

Approximately 10% of the delegates attending Inter-noise 2022 in-person signed up to the scheme, which was a fantastic accomplishment! Two buddies were assigned to each mentor so that buddies could get to know each other and possibly explore the conference together if they wanted to. It was up to buddies and mentors to decide how often they would like to meet, but some of the suggested opportunities included:

1. **Pre-conference:** Buddies and mentors were encouraged to have a video call to get to know each other a little before the

conference and so that they would recognise each other.

2. **Early Career Group breakfast:** Buddies and mentors were encouraged to meet for the first time in-person at the Early Career Group breakfast on the Monday morning of the conference.
3. **First break:** Buddies could catch up with their mentor to discuss how the first session had gone and ask any questions about how the conference was operating.
4. **Lunch breaks:** Opportunity for all buddies and mentors to get together so that mentors could introduce their buddies to other conference attendees and some of the leaders of the IOA.
5. **Conference dinner:** Buddies and mentors were encouraged to meet at the conference dinner.

During the conference, casual feedback indicated that a lot of buddies and mentors had met several times, and that the Buddy Scheme had helped the buddies to settle into the conference more easily and meet more people at the conference than they may otherwise have done. Feedback after the conference was largely positive, including:

- "As someone coming to a conference and knowing no one, it was great to have someone to look out for."
- "It was good to meet people beforehand, so that I didn't feel like everyone at the conference was a stranger. My mentor and buddy were really helpful for finding people I wanted to speak with during the conference —

I didn't expect there to be so many people!"

- "The choice of buddy and mentor was perfect. My buddy and I were surprised how you could match us so well!"

Suggestions provided in the feedback following the scheme have been reviewed and many will be incorporated into future events, including at Reproduced Sound 2022 in November.

I INCE has indicated that it would like to run a buddy scheme at its future Inter-noise conferences. It is also hoped that the buddy scheme will be repeated in one form or another at all IOA meetings and conferences, whether it's provision of one point of contact for people attending a branch meeting or a full buddy scheme for future one-day meetings and conferences. Please contact me if you are arranging a meeting and would like further information.

Please also contact Angela if you have any suggestions for the Equality, Diversity and Inclusion Working Group. We need to hear from you, whether it's positive feedback or suggestions for improvement at diversity@ioa.org.uk

Physical Acoustics

By Professor Keith Attenborough

Physical acoustics includes studies of interactions of acoustic waves with a gaseous, liquid or solid medium on macro- and micro-levels. Also of interest is the propagation and scattering of acoustic and ultrasonic waves in inhomogeneous materials, including composite

(L-R)
Rodolfo Venegas,
Keith Attenborough,
Stuart Bolton,
Tomas Zielinski and
Kirill Horoshenkov



materials and biological tissues. Inter-noise conferences offer the opportunity to report developments in the understanding of how the propagation of acoustic waves in this medium is influenced by its physical properties and structure and how this knowledge can be used.

There were three sessions under the main topic of physical acoustics and with apologies to the many authors not mentioned, this brief report offers a rather incomplete coverage. The first session on *Multiscale porous materials*, organised by Rodolfo Venegas, included eight presentations, three of which were authored or co-authored by Rodolfo, concerned the propagation of sound in porous media with inner heat sources. This topic is relevant to thermophones, to photoacoustic spectroscopy and to the control of acoustical properties by inner heat sources. Claude Boutin presented predictions of the effects of inner elastic membranes on the acoustical properties of porous materials distinguishing their roles in partially open and closed pore systems. Tomasz Zielinski described predictions and measurements on 3D printed porous materials highlighting the significant contributions of nanopores in the solid frame.

The second session, organised by Tim Starkey, on *Acoustic and elastic metamaterials*, included 12 presentations on topics including acoustic black holes, coiled space absorber designs for engine inlets, the role of metamaterial ideas for improving silencer transmission loss and in the design of aircraft fuselage panels.

The third session organised by Shahram Taherzadeh on *Airborne surface and edge waves* included two papers. The first given by Keith Attenborough described predictions of acoustic surface wave speeds over comb-like boundaries and comparisons with frequency- and time-domain data obtained over parallel aluminium strips over a hard boundary. The second paper, given 'virtually' by Steve Mellish, described how a modal theory could be used to explain several phenomena associated with propagation over grooved surfaces including resonant groove interaction and non-specular reflection.

Signal Processing, Reproduction and Diagnostics

By Adam Hill

There were six sessions under the main topic area of *Signal Processing, Reproduction and Diagnostics*, covering the subject areas of spatial audio, sound reinforcement, and audio transducers and transducer arrays. The main topic area was chaired by Elena Shabalina (d&b audiotechnik, Germany) and Adam Hill (University of Derby, UK).

Spatial audio covered three sessions and was chaired by Franz Zotter (Institute of Electronic Music and Acoustics, Austria) and Hyunok Lee (University of Huddersfield, UK). The papers within these sessions covered a range of topics including spatial audio for noise control, distance perception of virtual sound sources, and spatial audio for interactive hearing research.

The sound reinforcement session, which was thought to be the first on the subject to be held at Inter-noise, was chaired by Marcel Kok (dBcontrol, Netherlands) and Elena Shabalina (d&b audiotechnik, Germany). Paper topics covered sound exposure due to audience participation at large-scale popular music events, subwoofer array design for ancient outdoor theatres, and a review on the challenges of outdoor sound field control.

Papers within the audio transducers and transducer arrays session, chaired by Mattia Cobianni, Roberto Magalotti (both of Bowers and Wilkins, UK) and Valentina Cardinali (B&C Speakers, Italy), covered areas such as loudspeaker modelling using multi-physics packages and computational efficient time delay estimation approaches for loudspeaker localisation.

It was great to see all sessions within this main topic area to be so well attended, with engaging and exciting conversations arising from the fascinating selection of papers presented.

Thermo- and aeroacoustics

By Maria Heckl

The main topic "Thermo- and aeroacoustics", organised by Maria Heckl and Nicolas Noiray, had nine sessions in it and 58 presentations. The sessions were:

- Flow-acoustic interaction in ducts, organised by Susann Boij and Mikael Karlsson

- Nonlinear thermoacoustics, organised by Larry Li
- Experiments in thermoacoustics, organised by Viktor Kornilov
- Research in thermoacoustics and aeroacoustics by the Marie Curie network POLKA, organised by Maria Heckl
- Indirect noise in combustors, organised by Francesca De Domenico
- Data-driven methods, organised by Luca Magri
- Network models for predicting and damping of thermoacoustic instabilities, organised by Dong Yang
- Noise control in flow duct, organised by Lixi Huang
- Aero- and thermo-acoustics of annular and can-annular system, organised by Nicolas Noiray and Giovanni Campa.

It was nice to see that quite a few speakers used the assertion-evidence approach (see www.assertion-evidence.com/), where the presentation is built on key messages (assertion), rather than on topics, and supported by plenty of visual material (evidence).

Aircraft Noise

By James Trow

The aircraft noise topic was incredibly well represented at conference. This was particularly pleasing given the challenges faced by the aviation industry and those working on projects and research associated with aviation in the field of acoustics in recent years.

The majority of the aircraft noise topic sessions and presentations were held over the second and third days of conference with the airport community noise sessions covering two full days on its own. Other sessions included:

- aircraft interior noise; and
- aircraft supersonic noise.

One highlight of the aircraft noise sessions was a presentation by Peter Coen summarising NASA's work towards achieving a global consensus on acceptable sound levels for overland supersonic flight. NASA has been looking at how the 'sonic boom' could become a soft 'sonic thump' through the design of aircraft. During the presentation the sonic thump was likened to a "car door being closed from across a street." NASA has already undertaken virtual workshops focusing on strategies for estimating



noise exposure levels and conducting surveys to characterise annoyance from the ‘thump’. However, actual community overflight tests using its X-59 research aircraft are being planned providing a real-world dataset!

Environmental Noise

By David Waddington

The environmental noise topic was a major contributor to the success of the conference. If anything, the main topic chairs, David Waddington and Doug Manvell, could be accused of overdoing it, because with two parallel sessions running over the three days, an often heard grumble was that there was too much on, and too many sessions at the same time that the delegates would like to attend.

In fact, the environmental noise Chairs deserve the credit for assembling outstanding sessions with world class presenters and papers. They were Antonio Martinez, Bill Davies, Bo Søndergaard, David Waddington, Dick Botteldooren, Douglas Manvell, Frits van der Eerden, Gaetano Licitra, Graham Parry, Jacques Burillier, James McIntyre, Jean-Pierre Clairbois,

Jens Schultz Thers, Judicaël Picaut, Julija Smyrnova, Keith Attenborough, Kiril Horoshenkov, Louise Beamish, Paul Donovan, Sabine von Hunerbein, Simon Shilton, Timothy Van Renterghem, and Truls Gjestland. The environmental noise sessions were enjoyable experiences due largely to their efforts in recruiting authors, assessing papers and chairing sessions.

The sessions on *Noise mapping* and *Smart cities* attracted many papers and were particularly well attended. Sabine von Hunerbein earns a special mention for stepping in at the last minute to make the *Wind turbines and other renewable energy noise* session one of the highlights of the conference. Perhaps the most remarkable presentation of the conference was given in the *Environmental Noise Legislation and Policy* session by Tony Clayton. When the submitted video on the history of BS4142 did not play due to an administrative fault, Tony stood in to give a highly entertaining, impromptu talk through the presentation, which he had not previously seen. Tony’s performance

was greatly enjoyed by all, even more than the Environmental Noise whisky tasting arranged by Jim McIntyre, and should Tony choose to retire, he is assured a new career as a Northern stand-up comic.

The conference’s three days were full of opportunity to learn, discuss and network with the leading practitioners and researchers in environmental noise. The sessions were well-attended in-person and online, and thankfully, the recordings and submitted videos are still available to compensate for session clashes. After a couple of years as a virtual conference, it was great to be back face-to-face to further strengthen and develop one’s environmental noise network as well as one’s knowledge.

Building Acoustics

By Carl Hopkins

Building noise control and architectural acoustics was, once again, one of the largest topics at Inter-noise with a variety of papers from researchers, industry and consultants. Low-frequency sound transmission continues to be flagged as a major issue with a particular focus on impact sound insulation, and with timber

constructions. There is also an increasing number of structure-borne sound sources, other than footsteps, which led to a focused session on noise and vibration in gymnasiums as well as more general assessments on the measurement of structure-borne sound power. There were sessions focusing on the prediction of sound transmission in buildings that were complemented by a session on machine learning in building acoustics. Sessions on the regulatory aspects of building acoustics (including ventilation noise limits) that provided a link to real-world problems linked to measurement and prediction. There were also popular sessions on room acoustics of educational spaces.

Transportation Noise and Vibration

By Matthew Muirhead
In keeping with tradition, transportation noise and vibration covered several sessions on all three days with an excellent variety of presentations from participants

across the globe. The increasing prevalence of electric vehicles and the greater awareness of the importance of soundscapes was reflected in sessions on audible warning systems and auralisation.

A common theme that ran through many of the presentations, and is not just limited to transportation it must be said, was that of policy, guidance and standards seeking to address noise and vibration issues but still falling short on some of the finer detail. Whether it is tyre labelling, acoustic vehicle alerting systems or even something as old fashioned as noise barriers; there is still room for improvement on how these are best defined and directed to benefit society.

As such it was heartening to see so many presentations reflecting a clear understanding of the issues and proffering some clear ways forward for the industry. And with transportation noise showing no signs of ceding its position as the dominant cause of noise related adverse health impacts this cannot come a moment too soon.

Active Noise Control

By Steve Elliott

The Active Control Topic at Inter-noise 2022 consisted of six sessions in four areas:

1. active and passive noise control;
2. advanced and intelligent active noise control;
3. automotive applications of active control; and
4. smart structures.

There was a mixture of physical and virtual presentations in these sessions from a very international series of presenters. Although there was some overlap between the areas, the first one focused more on the physical aspects of active control and the synergies between active sound control and more traditional passive methods. The second area was more concerned with signal processing approaches, both in terms of control algorithms and also the increasing use of virtual sensing in active sound control systems, where error microphones are not within the region of space being controlled. There is an ongoing interest in applying active sound control in cars and other vehicles, as discussed in the third area, with interesting papers on [P28](#)



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the use of nonlinear systems to control impulsive noise sources. Finally, the fourth area was focused on the active control of structures and the overlap with metamaterials.

Acoustics Materials

By Kirill Horoshenkov

The special session on acoustics materials was organised by Kirill Horoshenkov of the University of Sheffield (UK) and Paolo Bonfiglio of Materiacustica (Italy). The session attracted 13 papers from a wide range of countries presented on the second day of the Congress. The topics of the papers in this session span a very broad area of research from the acoustical properties of Japanese cedar wood by Akiko Sugahara (Japan) to commercial thermal insulators by Valteri Hongisto (Finland). The presentations were a good balance of experimental work, e.g. the work by Stefano Mundula of London South Bank University (UK), theoretical optimisation, e.g. by Cedric Maury of LMA CNRS

(France) and numerical studies, e.g. by Guochenao Song of Purdue University (USA). It was chaired by Teresa Bravo of ITEFI (Spain).

Soundscapes and Acoustic Quality

By Jian Kang

The main topic of Soundscapes and acoustic quality covered a range of sessions, including indoor soundscapes, restorative soundscapes — measurement, analysis, design, industrial and rural soundscapes, soundscape and health, and artificial intelligence. In terms of space types studied, while most previous studies have concentrated on urban open public spaces, in this year's Inter-noise, soundscape works on national parks and industrial sites were presented. In terms of countries/cultures, while much work has been carried out in Europe, soundscape investigations on other countries including Indonesia were presented. Beyond outdoor soundscapes, indoor soundscapes have been paid much attention, especially with the

increased amount of home-working during and after the pandemic. Another feature of this year's Inter-noise was the strong focus/interests in practice, from consultants-led papers, to activities on soundscape practical example collection. Soundscape prediction and soundscape and health remain hot topics in the field of soundscape.

Profession, training and outreach

By Angela Lamacraft, Chair of the Institute of Acoustics Equality, Diversity and Inclusion Working Group

I had the privilege of co-Chairing the second Profession, education, training and outreach session on Wednesday morning of Inter-noise with Professor Patricia Davies. The first paper, by Dr Prokofleva, discussed some of the complications of teaching acoustics in a higher education course, such as the diversity of prior knowledge of the students, who can come from a range of backgrounds such as environmental health, sound





mixing, architecture, design or salespeople of acoustic products. Commitments away from studying such as family and work further complicate the study of mature students. Dr Prokofleva concluded that a tailored approach to students' individual skills and knowledge is essential.

Next, Lily Wang presented some of the ideas that have been used by the University of Nebraska to improve inclusive excellence. The following strategies have been implemented so far:

- offering training to faculty, staff, and graduate students on recognising implicit bias and tactics for interrupting it;
- growing the number of allies who actively support persons from underrepresented groups;
- mandating required diversity statements from applicants to UNL engineering faculty positions, and providing rubrics on how those would be assessed (both to faculty candidates and search committee members);
- creating a 'Celebrate Diversity' website;
- sponsoring a College Distinguished Speaker series;
- providing training on mastering

'crucial conversation' skills for productive, respectful communication in high stakes conversations; and

- deploying a regular climate survey.

My paper provided a summary of some of the benefits of improving equality, diversity and inclusion within organisations before providing ideas for methods to improve EDI. I contacted many different types of organisations, including major employers of acousticians, contractors and engineering organisations that specialise in diversity, to investigate what measures can be implemented.

Professor Simon Chandler-Wilde then presented the results of an EDI survey of UK Government-funded research networks in the UK (the Network of Networks, a union of research networks, largely funded by the UK Engineering and Physical Sciences Research Council (EPSRC)). The survey asked members, for details of academia/industry affiliation, gender, age, ethnicity, disability, sexual orientation, religion or belief, caring responsibilities and socioeconomic disadvantage. The survey also

asked how inclusive the networks are perceived to be. Professor Chandler-Wilde also discussed how to improve events and what areas we should be most mindful of.

Finally, Matthew Muirhead provided an overview of the IOA's first virtual work experience (VWEX) offering, born out of COVID-19 restrictions. Matthew discussed the considerations of providing VWEX, such as whether it should be provided by the IOA or an external organisation; the age range of interest; reaching the desired audience; length and format of the package; the balance between learning about technical aspects of acoustics or about careers in acoustics; and the breadth of topics and careers within acoustics to cover. Feedback from those involved with the project indicates that many consider it to be a fantastic initiative and it is hoped that this will be a long term initiative for the IOA.

With many other exciting things going on, such as multiple parallel sessions, a studio tour and an I-INCE meeting to discuss Inter-noise 2023, attendance at the session was not as high as I'd hoped it would be. EDI is an important [P30](#)

topic for many reasons, and improving EDI is essential for the future of our industry, therefore I am hopeful that future EDI sessions will be made more prominent.

The final session of the Profession, education, training and outreach programme was an open panel discussion on the future of education and training in acoustics. This was a 'Question-Time' style discussion chaired by Peter Rogers, with a panel comprising:

- Bob Bernhard (President of I-INCE and Vice-President for Research, University of Notre Dame)
- Trevor Cox (Professor of Acoustics, Salford University),
- Simon Gage (Director of Edinburgh Science), Ben Ward (CEO of Winchester Science Centre)
- Brigitte Schulte Forkamp (Emeritus Professor of Acoustics, Technical University of Berlin) and
- Josie Nixon (Chair of the IOA Early Career Group).

The wide-ranging discussion was well-attended and included discussion on the issues recruiting students onto acoustics courses and into industry and research positions, how to improve diversity in the profession, what road blocks may exist for people entering the acoustics profession and how these could be addressed.

Theme-related: Noise control in a more sustainable future

By Peter Rogers

This session — the main topic of Inter-noise — was chaired by Peter Rogers of UK consultancy, Sustainable Acoustics, with a diverse set of speakers who discussed a range of topics such as aircraft noise and carbon reductions to the economic perspective, and ground breaking new policies. The presentations given saw a clear narrative evolve, where the UN 17 SDG were used as a lens through which to consider how acoustics was relevant to future sustainable outcomes, to a new framework being proposed with a strong and clear call for action by acousticians in the remaining years in the run up to the 2030. The Welsh Government, and the speaker Martin McVay, stood out as bold leaders for the way policy can be used to that embraced positive soundscape as part of their sustainability vision. This is supported by the



Above:
Keynote speaker,
Professor
Maria Heckl

UN Frontiers Report of 2022, challenging the audience to tackle noise pollution and create diverse and healthy soundscapes. Thanks go to all the speakers for their contributions, and the hope is that those witnessing this topic will be inspired to act.

Computational Acoustics

By Professor Stephen Dance

There were seven papers in this Computer and Simulation theme session. The papers were diverse; starting with roof noise experiments and numerical investigation of lightweight structures during heavy rain in India and the effect of the angle of attack on the noise levels produced. Then on to quietening submarines using wavy geometries for trailing edge noise reduction on wings, 15 dB was achievable. This was followed by high frequency boundary element methods being applied to multiple scattering in car cabins. To finish the session a novel use of text to speech for this pre-recorded presentation on flow induced noise in ventilation system was given, which worked well once you got use to the computer voice.

Sustainability working group

By Richard Grove

Following a call by Paul Lepper of Loughborough University in Acoustics Bulletin, the Sustainability Working Group was formed, the first of its kind for Inter-noise and perhaps even for an acoustics conference of any kind. With COP 26 in Glasgow's rear view mirror, it was paramount that the conference considered sustainability at its organisational core. The group worked hard in partnership with our hosts, the Scottish Exhibition Centre, Tranquil City, The Scottish Wildlife Trust, and Trees for Life, to develop a wide variety of initiatives which focused on healthy and sustainable travel, soundscapes for good health and wellbeing, and contributions to rewilding of the Scottish Highlands.

A legacy report is due to be published imminently summarising the outcomes of these activities, which we hope to be the start of a more sustainable future for events in the acoustics calendar to benefit the planet, people and our overall prosperity. P32



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Scottish Soundscape Prize

By Diana Rogers, Director and Sustainability Advisor

Urbanisation has been identified as one of the key global megatrends. The UN estimates that one half of the global population currently live in cities. By 2050 two-thirds of all humanity will be living in urban areas – that is a massive 6.5 billion people.

Noise has been highlighted as a major threat to human health and wellbeing in the recent UNEP Frontiers Report titled: *Noises, Blazes and Mismatches*¹. This report identifies that cities are becoming an epicentre for noise. This is having a negative impact on human health and emotional wellbeing and on nature and biodiversity. For humanity, natural sounds are scientifically proven to generate psycho-physiological health benefits and to dampen down our stress responses. This is vital for our resilience and normal function. Within the animal world many species rely on sound to communicate and for their survival – for breeding purposes, threat detection and to find food. Natural sounds are an integral part of a healthy biosphere.

But in cities it is not always possible for people, or wildlife, to escape the noise to a more natural

environment. Many now feel that creating sound environments for wellness (for people and for nature) is an essential nutrient for balanced sustainable development within socially responsible cities. Positive sound is one of the key ingredients of a Sustainable City. So how can the acoustics industry respond to this challenge?

As part of the work of the Inter-noise sustainable working group (SWG) the Scottish Soundscape prize was launched in partnership with the Scottish Wildlife Trust. The challenge set was for UK-based acoustics students to create an audio and visual soundscape design experience inspired by natural Scotland. The Scottish Soundscape Prize was kindly sponsored by Sustainable Acoustics and d&b audiotechnik.

A shortlist of submissions was exhibited throughout the conference providing many with a moment of sonic relief and calm in an otherwise hectic space.

Judging was carried out toward the end of the conference. The ISO 12913 Soundscape Standard was used by the judges to inform their considerations, while they assessed the performance of each soundscape against the competition brief, which had set out three main objectives:

1. To create a restorative sonic environment. To make the SEC Mezzanine, (a noisy and reverberant space), more relaxing and restorative to support the wellbeing of delegates at conference.
2. To be inspired by and to connect the listener to natural Scotland and to create the soundscape experience from the perspective of Glasgow, with this context providing an anchor and a space of place.
3. To explore humanity's fundamental reliance on our natural world. To explore humanity's fundamental embraces and humanity's fundamental reliance on the natural world, providing a journey for the listener.

The soundscape was then objectively assessed by Grant Waters of Tranquil Cites and Anderson Acoustics, using a dummy head and psychoacoustics assessment methods and will be reported on in the Inter-noise Legacy Report.

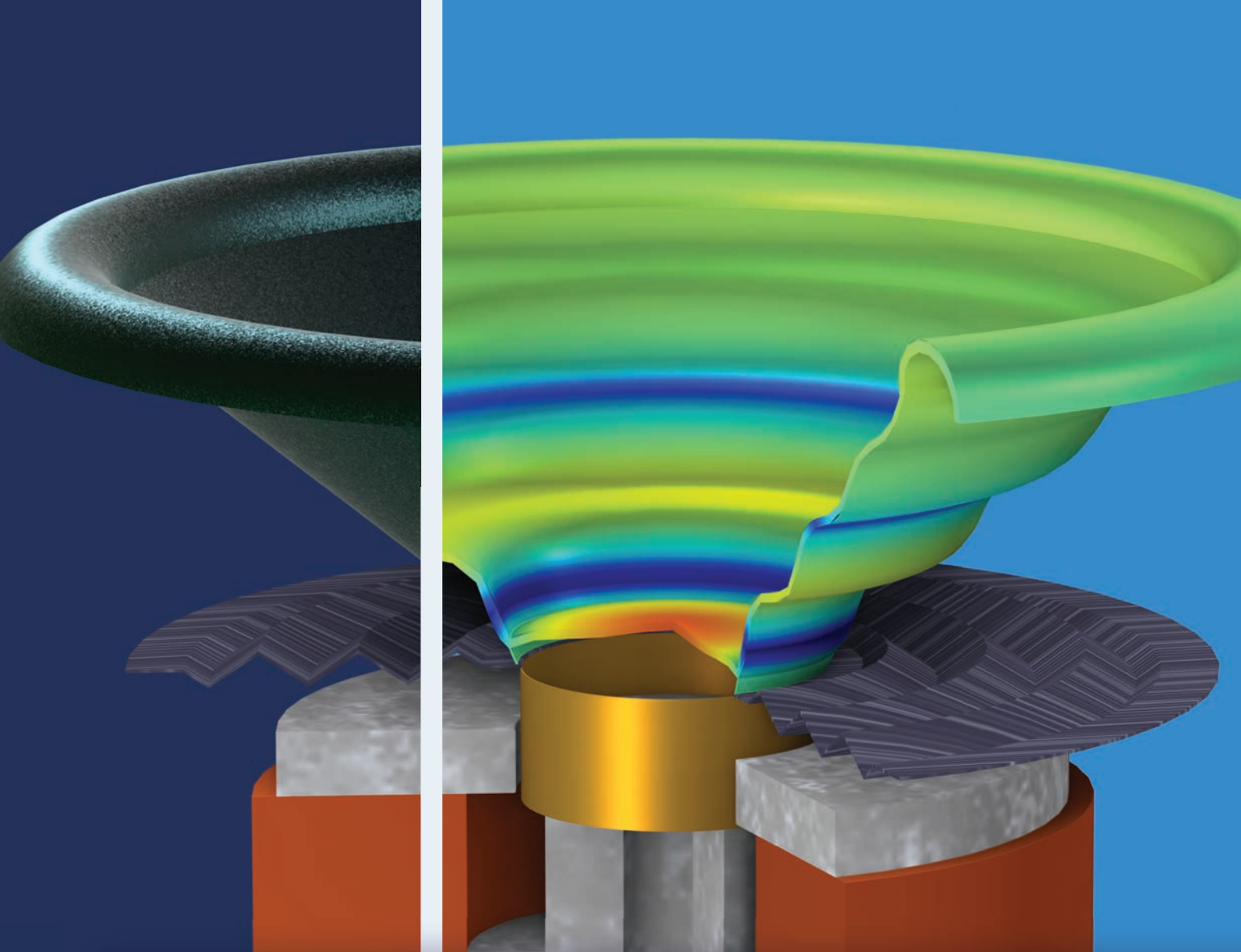
The results were announced at the end of the conference. The winner and recipient of the Scottish Soundscape Prize 2022 trophy and £500 prize money from sponsor Sustainable Acoustics was Carmen Rosas-Perez from Herriot-Watt University. [P34](#)

Below:
Carmen Rosas-Perez from Herriot-Watt University, winner of the Scottish Soundscape Prize 2022



References

- 1 [https://www.unep.org/resources/frontiers-2022-noise-blazes-and-mismatches#:~:text=The%20UN%20Environment%20Programme%20\(UNEP,for%20effective%20and%20timely%20responses.](https://www.unep.org/resources/frontiers-2022-noise-blazes-and-mismatches#:~:text=The%20UN%20Environment%20Programme%20(UNEP,for%20effective%20and%20timely%20responses.)



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The runner up, winning £250 was Kieran Davies, from the University of Salford.

Competition winner, Carmen Rosesa-Perez said: "I'm so pleased people enjoyed [the soundscape] and found all the elements that I wanted to transmit with it.

"These sounds are in fact very special to me. All the recordings were done in Scotland, of course, on a field recording trip, that was one of the most wonderful experiences I've ever had."

Rebekah Strong, Nature Based Solutions Policy Adviser at the Scottish Wildlife Trust, said: "It was a wonderful opportunity be involved in the Scottish Soundscape competition. The entries were all fantastic and it was fascinating to see the different associations and interpretations of nature and the emotions evoked by the soundscapes. It was a great way of demonstrating the ways in which nature helps us."

Peter Rogers, MD of Sustainable Acoustics, said: "This was a ground-breaking and exciting soundscape competition, which we have been delighted to sponsor. We hope

this provides inspiration for how composed soundscapes can be useful in practice."

The soundscape experiences are available to listen to and view on Sustainable Acoustics website www.sustainableacoustics.co.uk

One of the aims of the Scottish Soundscape competition — to improve our understanding of how soundscapes can be used in practice has been achieved and the intention is to repeat the competition in the future to keep the progress from theory into practice going.

Above:

The Scottish Soundscape prize judging panel (L-R) Peter Rogers, Professor Jian Kang, Katherine Howlett, Professor Chris Barlow, Josie Nixon, Rebekah Strong, Scottish Wildlife Trust and Colette Martin, Scottish Wildlife Trust

Thanks go to the sponsors, Sustainable Acoustics Ltd and d&b audiotechnik and to the Scottish Soundscape prize partner, The Scottish Wildlife Trust, as well as to all the entrants. 🌐

Message from the Congress President and Technical Programme Chairs:

"This was a unique opportunity for professionals working in the field of noise control, acoustics, and vibration, to come together and exchange ideas about their work in an environment conducive to paper presentations and discussions, and informal networking and with many exhibitors. More than 100 technical sessions covered a wide range of issues facing the industry, the research community and the community at large."

Congress President and Technical Programme Chairs

- Barry Marshall Gibbs, Congress President
- Alistair Somerville, Technical Programme Chair
- Chris Barlow, Technical Programme Chair
- Bob Craik, Proceedings Editor



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David Mason, Director of Scott Brownrigg Architects.



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Marion Burgess

Marion Burgess received her Honorary Fellowship from Stephen Turner, the Immediate Past IOA President, just before the start of Inter-noise at a meeting of the I-INCE Board of Directors.

CITATION

After completing a degree in physics, Marion Burgess commenced working in acoustics in an Australian building research laboratory in 1969. Since then, she has had over 50 years experience in many aspects of acoustics including building, environmental and occupational noise measurement, assessments, control and research.

Until her retirement, Marion Burgess was a Research Officer at the Canberra campus of the University of New South Wales (UNSW). Marion is currently an Honorary Associate Professor both at the Canberra and the Sydney campuses of that university, at which she continues to present specialist classes in occupational and environmental acoustics to undergraduate and post graduate students in three faculties, as well as assisting to supervise research students. Marion is also an Adjunct Associate Professor at University of Technology Sydney assisting with the development of courses on environmental noise.

Marion has delivered many courses over the years to various government and non-government organisations, including Australia's Defence Department, on workplace, occupational and transportation noise measurement and analysis.

In conjunction with the Australasian Association of Acoustical Consultants (AAAC), an ongoing flexible, distance learning educational activity, the Professional Education in Acoustics, is managed via the University of NSW and delivered by Marion. This course, which has now been offered for many years, was originally

Right:
Marion Burgess receiving her Honorary Fellowship from Stephen Turner



developed by her. It is based on the UK's Institute of Acoustics education programme concept but adapted, to address a need for further educational opportunities for those entering the acoustic consulting field or working in government agencies in acoustics in the Australian region.

Marion's research work has been primarily in relation to environmental and transportation noise. In recent years, Marion has undertaken a number of collaborative research projects related to cognitive effects of noise with colleagues at UNSW from the School of Aviation and on soundscape with School of Built Environment. She has been actively publishing in these fields during her career.


In addition to research projects, Marion regularly undertook consulting work in the field of environmental noise, including road, rail and air transport as well as land use planning for residential development.

Marion is a member of a number of relevant Standards Australia committees. She is an active member of the Australian Acoustical Society and is currently an Editor of its journal *Acoustics Australia*. She is the current Past President of the International Institute for Noise Control Engineering and a former President of the International Commission for Acoustics. She was active in the committee working to create the International Year of

Sound held in 2020 and 2021 and has been the co-organiser with Michael Taradoukis.

Marion regularly participates in international conferences and was the Chair of the International Congress in Acoustics held in Sydney in 2010. She also has a key role in the committee for Acoustics 2023, a joint meeting of the Acoustical Society of America, Australian Acoustical Society, the Western Pacific Conference on Acoustics (WESPAC) and the Pacific Rim Underwater Acoustics Group, to be held in Sydney in 2023. She is regularly invited to present papers at national and international conferences in acoustics. In 2018 she delivered plenary lectures at the International Congress on Sound and Vibration in Japan and at the WESPAC 2018 Congress in India. She presented the plenary lecture at the "Prevention and Control of Urban Noise Pollution International Technology Summit" in Shanghai in 2019 and also a short course on environmental noise control.

In recognition of her contributions to acoustics in Australia and internationally, Marion Burgess was awarded the membership of the Order of Australia in 2015. She is also a Life Member and Fellow of the Australian Acoustical Society.

The Institute of Acoustics is delighted to award an Honorary Fellowship to Marion Burgess in recognition of her outstanding contribution in the field of acoustics. 

Nuffield Research Placements

In this issue IOA STEM committee chair Matthew Muirhead reports on the Nuffield Research Programme, and provides a few reminders on upcoming initiatives

By Matthew Muirhead

Organised by STEM Learning, Nuffield Research Placements are designed to provide young people from disadvantaged backgrounds increased exposure and opportunities to STEM-related university courses and careers.

The primary mechanism for this is to invite employers to support A-Level students over the summer through a research placement. These placements can be a combination of online and in-person activities with up to two weeks' work experience culminating in a project report and poster to be completed by the student at the end of the programme.

The programme works with more than 150 organisations including universities, local government and public sector agencies as well as private companies. STEM Learning is continually looking for new supervisors who can share their passion for their area of work.

You can volunteer

I have been involved as a supervisor for the last two years and have learnt a lot about inspiring the next generation. It is a very flexible programme that need not take up too much of your time; for example, I met my students once a week (barring holidays) over the summer for 30 minutes to help direct their work. The work that the students carry out could be something of relevance to your company or merely something of academic interest. One of my projects involved the students assessing the variety of soundscapes in their local area and devising ways in



which they could be improved. It would be good if more acousticians got involved in the programme as, somewhat unsurprisingly, the students I worked with did not know about the wide range of careers on offer within the acoustics industry.

If you are interested in becoming a supervisor for 2023, please take a look at stem.org.uk/nuffield-research-placements and/or email nrpenquiries@stem.org.uk to find out more.

EngineeringUK careers booklet

The IOA also recently fed ideas back to EngineeringUK on their latest careers booklet. It was interesting to note that booklet considered 12 areas of engineering but did not include environment or acoustics as a stand-alone sector. Nevertheless, acoustics appeared as a topic in several of the types of engineering that were listed, and we provided ideas on how it could be considered within a few others as well. Look out for this appearing shortly on an updated suite of resources on neonfutures.org.uk


Above: Nuffield Research Placements are designed to provide young people from disadvantaged backgrounds increased exposure and opportunities to STEM-related university courses and careers

Matthew Muirhead is the recipient of the 2022 IOA Promoting Acoustics to the Public Award.

Edinburgh Science Festival

Another two things to look out for happening around now are the latest running of the virtual work experience programme for students and the Edinburgh Science Festival careers hive. The virtual work experience programme has been renamed 'Architecture, Ocean Science, Music and More - STEM Careers in Acoustics', includes two new activities and runs during the October half-term. This time around advertising for the event started earlier and more students were signed up. Look out for a report on how the event went in the next issue. Meanwhile the Edinburgh Science Festival runs from the 7th to 12th November this year and, as usual, includes an IOA sponsored activity with IOA volunteers speaking about their career and experiences in the field to S1-S3 pupils from across Scotland.

As always, do let us know about your exciting STEM activities or to find out more about how we can help. Please get in touch at

STEM@ioa.org.uk 

Changes at the IOA Early Careers Group

The IOA's active Early Careers Group aims to bring together a diverse network of acoustic professionals in the early stages of their career. This is by promoting peer knowledge sharing and support, it also provides a link to the knowledge of established acousticians and a platform for the continuing development of new and existing skills.



By Josie Nixon, ECG Chair

IOA Early Careers Group (ECG) members are normally under 35 years old or within the first five years of their career, so as well as being a good introduction to the IOA, the ECG organises a variety of activities for its members, such as social networking events, presentations and architectural tours.

Adam Woolley steps down

After two years of service Adam Woolley is stepping down as the secretary for the ECG in December. Adam has been fantastic in the role and members thank him for all his hard work. The ECG Committee has elected Diogo Pereira as Secretary for the next two years. Adam remains as the ECG representative for Underwater Acoustics, so remains as part of the Committee.

New Secretary, Diogo Pereira

Diogo did his undergraduate studies in audio engineering (2019) at Solent University. This was followed by a Master's in applied acoustics (2020) and since April 2021 he has been employed at Bickerdike Allen Partners.

Diogo said: "Acoustics is my passion as it combines my interest in physics, maths and music (and inherently some noise!).

"I have been a board member, newsletter manager and local representative for Portugal, of the Young Acousticians Network (YAN) since 2020. I am member and

newsletter editor for the Portuguese Acoustical Society and an Associate Member of the IOA.

"I have been a co-opted member of the ECG since 2021 when I joined the Webinars Working Group. I am an active member of the group; assisting in most tasks from drafting ideas to inviting presenters and preparing and coordinating events.

"In the future I intend to continue working with the Webinars Working Group and help the ECG grow and strengthen as well as collaborating with more organisations within the wider industry. Together with the YAN, I would also like to promote collaboration between acousticians in the EU and UK, be it from an academic or a consultancy background.

"I am really looking forward to becoming the ECG Secretary in December, helping to organise and strengthen the committee."



Above:
Diogo Pereira

ECG vacancies

There are a couple of ECG regional vacancies – if you are interested, please get in touch with the ECG (earlycareers@ioa.org) or the relevant groups directly.

The ECG is open to all members of the Institute (both corporate and non-corporate) who shall normally be under 35 years of age or within first five years of their career. The group is always keen to hear from members and non-members alike. To join the Early Careers Group, to find out more information or to voice your concerns, visit <https://www.ioa.org.uk/early-careers-group> ☺

Above:
Josie Nixon, Chair of the IOA Early Careers Group

IOA Early Careers Group webinar

Using Scale Modelling to Assess the Prehistoric Acoustics of the Stonehenge

By Prof. Trevor Cox

Thursday 24 November 2022 at 6pm by Zoom

With social rituals usually involving sound, an archaeological understanding of a site requires the acoustics to be assessed. This talk details how this can be done with acoustic scale models – although this is an established method in architectural acoustics, it has not previously been applied to prehistoric monuments. How Stonehenge was used is much debated, but these results show that sounds were improved within the circle compared to outside.

This webinar is open to all members.

Please register for this event at <https://www.ioa.org.uk/civicrm/event/info?id=768&reset=1>
Zoom details will be emailed to delegates shortly before the event.



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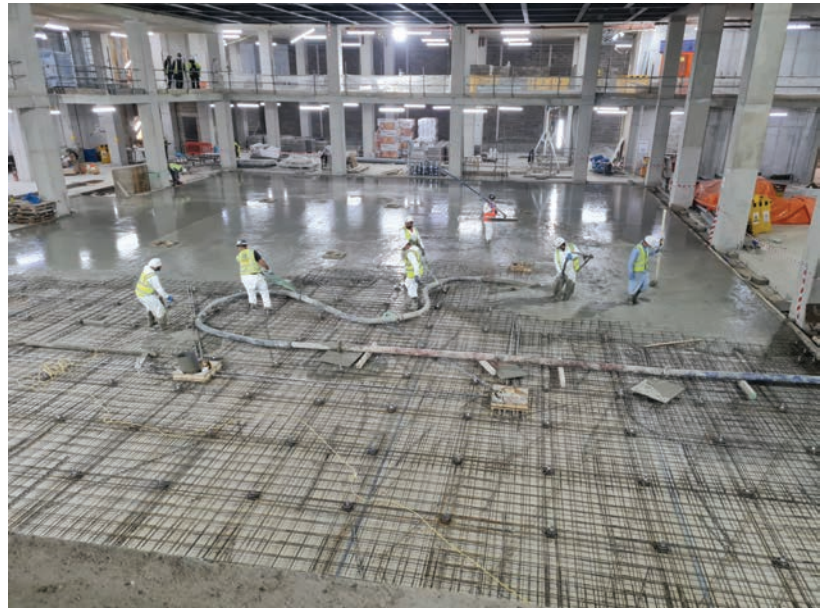
Mason U.K. have decades of experience in detailing box-in-box systems. We are the trusted partners for acoustic floating floors, walls and ceilings for customers as diverse as Abbey Road Studios, the BBC, Cinemas, PureGym, Peloton, Maybourne Hotel Group, Oxford and Cambridge Universities and many more. Detail is everything, we do not simply provide products, we provide engineering experience and site support to ensure designs and installations meet acoustic and vibration control requirements.

► Main Ballroom, Peninsula Hotel, London. Mason FSN Jack-Up system.



► Inertia bases, flexible connectors and pipe isolation system for Intel Corporation, Dublin.

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How ‘good’, is ‘excellent’?

Angela Lamacraft is the IOA Council lead for equality, diversity and inclusion (EDI). For this article, she asked Cameron Salisbury to write about how we should all help the engineering and technology industries become more diverse and inclusive.

By Cameron Salisbury

We use the term “excellence” quite lightly in my experience.

Sometimes even sarcastically... which is excellent. Curious, I did the old-fashioned thing of googling it, only to find that “excellence” translates to “extremely good”. So on a sliding scale of “good”, how “good” is “excellent”?

Equal Engineers is an organisation whose primary objective is to create inclusive engineering and technology organisations by increasing the diversity of the workforce and improving stakeholder health and wellbeing. They say:

“Our sector lacks in diversity and inclusion of under-represented groups. Diversity and inclusion though are proven to increase performance, growth and innovation, it also improves health, safety and wellbeing.” And it’s true.

It’s no big secret that the engineering industry leaves much to be desired on topics such as accessibility, inclusivity, diversity, representation.

I think it’s generally accepted that we could all do much more to encourage societal change and we could all do more to promote fair education and equal opportunities into engineering careers.

Sure, acoustics represents a fraction of the engineering industry, but does

that make it easier or more difficult to achieve true diversity, inclusivity and equality?

Jennifer Glover, Engineering Graduate of the Year

Recently, I attended the Engineering Talent Awards 2022 (powered by Equal Engineers) with Paul Shields and on behalf of Jennifer Glover (who unfortunately couldn’t make it on the night). Paul, Jennifer and I had been shortlisted for our contributions to the engineering industry that upheld the values of Equal Engineers and, in their eyes, demonstrated excellence.

The Engineering Talent Awards celebrate the diversity of the engineering and technology profession and aim to “...raise the profile of the engineering and technology professions across the UK and highlight diversity in engineering on a national platform. Through showcasing role models and inspiring people, we can celebrate the diversity of organisations and engineers”.

It was a wonderful evening, as we were surrounded by inspirational people.

Apprentices through to executive leaders, all standing for true excellence, all challenging the norm and all celebrating each other – not themselves.

Jennifer (AECOM) won the

award for Engineering Graduate of the Year, an award to celebrate someone who has demonstrated a passion for engineering throughout their studies and has continued to pursue this passion through new avenues in the workplace, especially by helping to create a diverse and inclusive engineering workforce.

She has already established a strong reputation as an acoustic consultant and leads the Awards Group at AECOM. She actively promotes engineering, as a Director’s Committee member of the Women’s Engineering Society, and as a STEM Ambassador. Everything achieved to date and the promise of her future impact in our industry, makes Jennifer an engineering role model.

Leading positive change

Paul Shields and I were shortlisted for Engineer of the Year and Executive Leader of the Year (no prizes for working out who was nominated for which).

The whole experience was incredibly humbling, and I hope to see acoustics continue to be so well represented in the future, specifically, for being ambitious in our contributions and approach to achieving a diverse, inclusive and equal engineering industry.

Ask yourself honestly, are we doing enough to lead positive change across our industry? On a sliding scale of “good”, would you describe our efforts as “good enough”, “good” or achieving true “excellence”?

www.equalengineers.com. ©



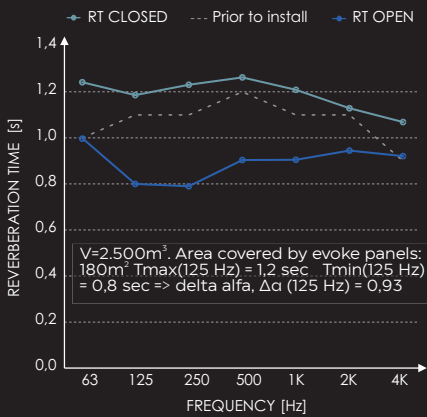
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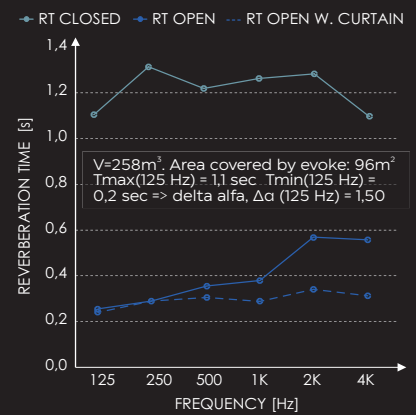


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Single partition comparison of a PA speaker with an omni-directional dodecahedron speaker

Firstly, why would you want to do this? Decent quality PA speakers are available for a few hundred pounds, considerably less than dodecahedron speakers.

By Mark Dowie and Thom King of HBK UK Ltd

As the Building Regulations for England & Wales (BREW) Part E Annex B testing method is still based on the now withdrawn ISO:140, the use of PA speakers is allowed (unlike the newer ISO 16283). We wanted to understand the difference between the two options and see what impact this could have on the measurement result and data.

The practical testing element of this idea was not as straightforward as we hoped! We needed to co-ordinate all the required kit and a suitable wall to test all at the same time. The office is busy that we could only book out two adjacent meeting rooms on a Friday

Below left:
Figure 1a:
Dodecahedron speaker with sound level meter on tripod

Below right:
Figure 1b:
Mackie PA speaker

afternoon. We also had to return some of the kit by last shipping that evening. We were against the clock which, unintentionally, made it more representative of a real-life test.

The plan was to perform identical tests as per the BREW guidance using each speaker. We had a dodecahedron speaker with matching amplifier and a Mackie SRM350 powered speaker. The measurements were done with Class 1 sound level meter and hand-held calibrator.

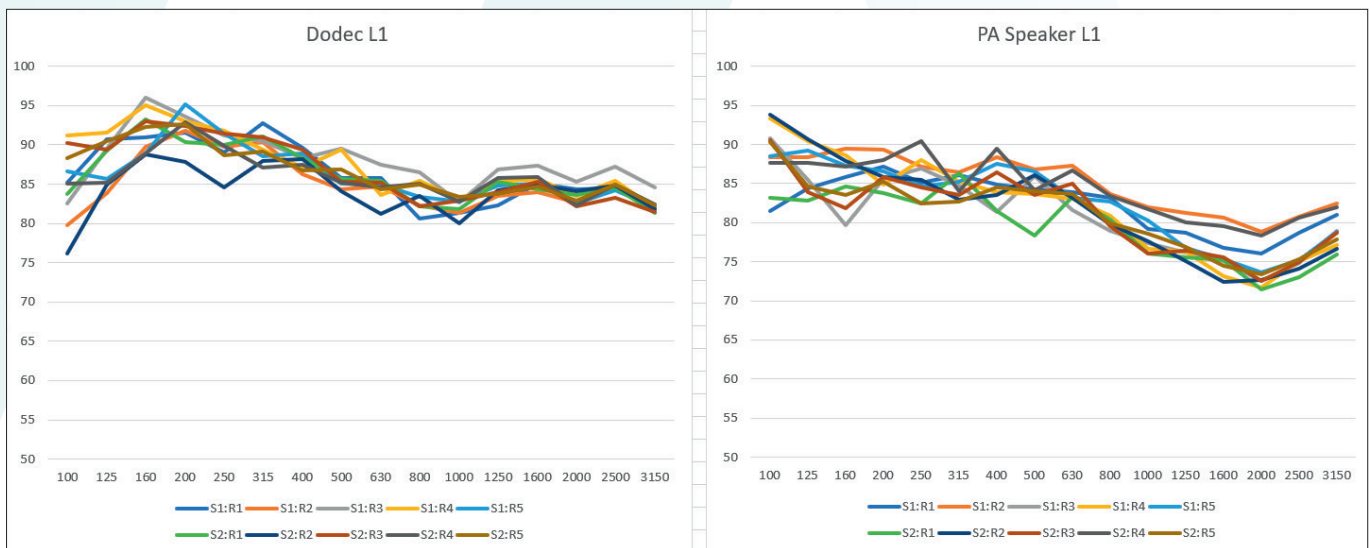
The meeting rooms were in the front corner of the first floor, had adjacent doors and shared a suspended ceiling. We were not expecting good results from an insulation point of view.

The test

Initially, we used the stationary measurement method with five discrete microphone positions for each of the two sound source positions, and took a 12 second average in each position. As the sound level meter is controlled by an iPhone App the room was empty during the measurements so there was no human absorption. We marked out the measurement and source positions on the floor to ensure consistency.

The sound level meter was placed on a lightweight tripod and moved to the next position by hand. We then left the room, shut the door and started the measurement from the App.





The two speakers did not sound the same. The volumes and weights are similar but the design principals are completely different. The Mackie has one horn-loaded tweeter and a single 10" woofer (bass speaker) with two front-firing bass ports to ensure it packs a punch as a PA speaker. Ports allow low frequencies inside the box to be vented and extend the low end coming from the front of the woofer. These features are to optimise the power output rather than the linearity.

The dodecahedron speaker is a closed box with twelve mid-bass drivers pointing in 12 different directions and is optimised to produce the 100 to 3150 Hz range required in sound insulation tests; the output drops off either side of these frequencies. Closed box speakers tend to have a smooth frequency response with a gentle roll-off at the low-end unlike ported speakers which have steep cut-off below the porting frequency.

The results

Of course, a key feature of a sound insulation test is that they are comparative measurements where the difference between the rooms is of the greatest importance. So how much difference do the speaker characteristics make to the final result? In this example...none!

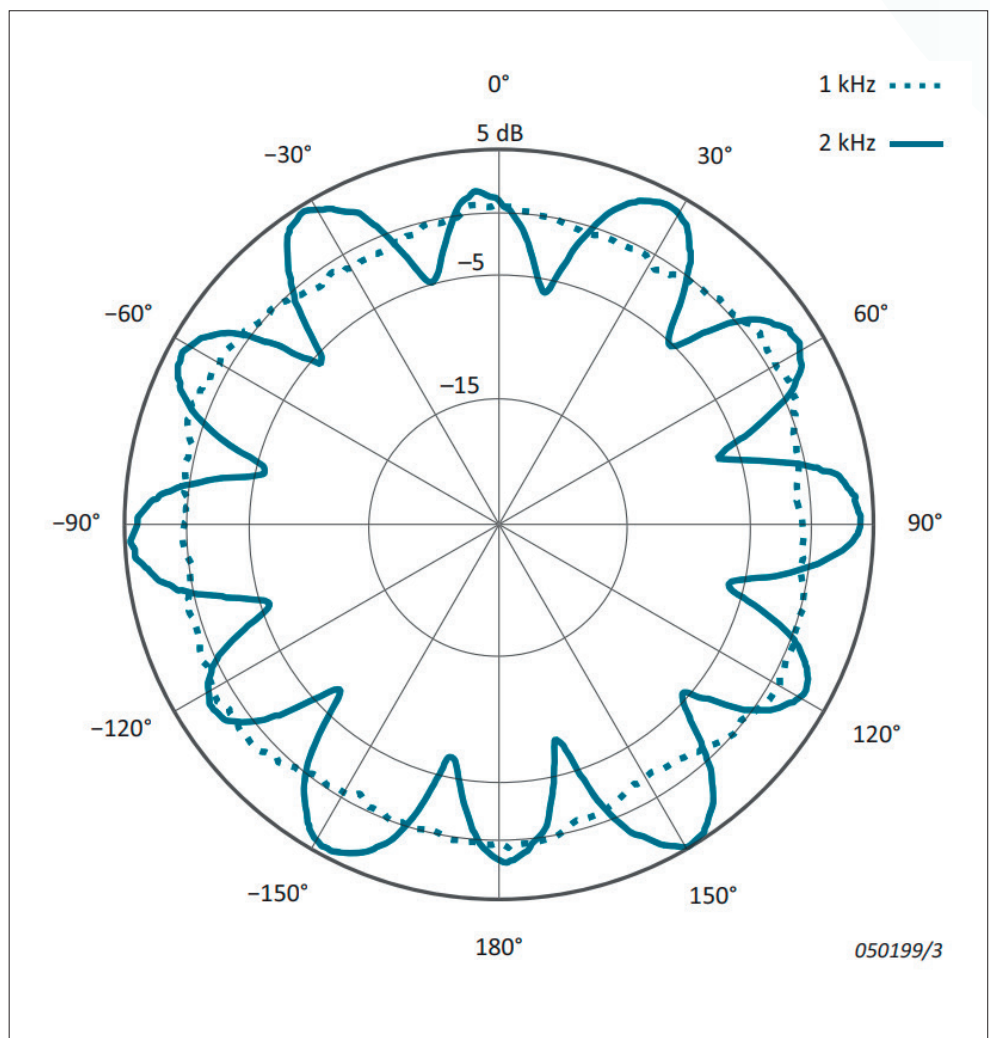
Both had a DnTw of 31 dB and a DnTw + Ctr of 28 dB. A poor result for the partition, but both speakers gave the same result.

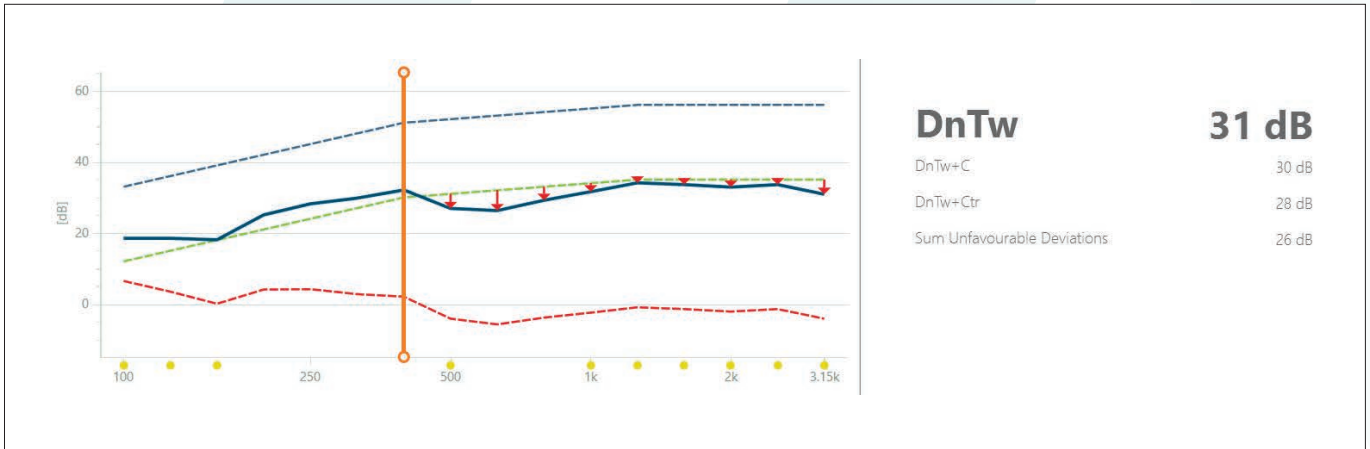
However, the sound level meter and associated software provides warnings where the measurement can be improved, and this can point us towards the differences between

Above:
The individual L1 measurements of each speaker are shown in Figure 2

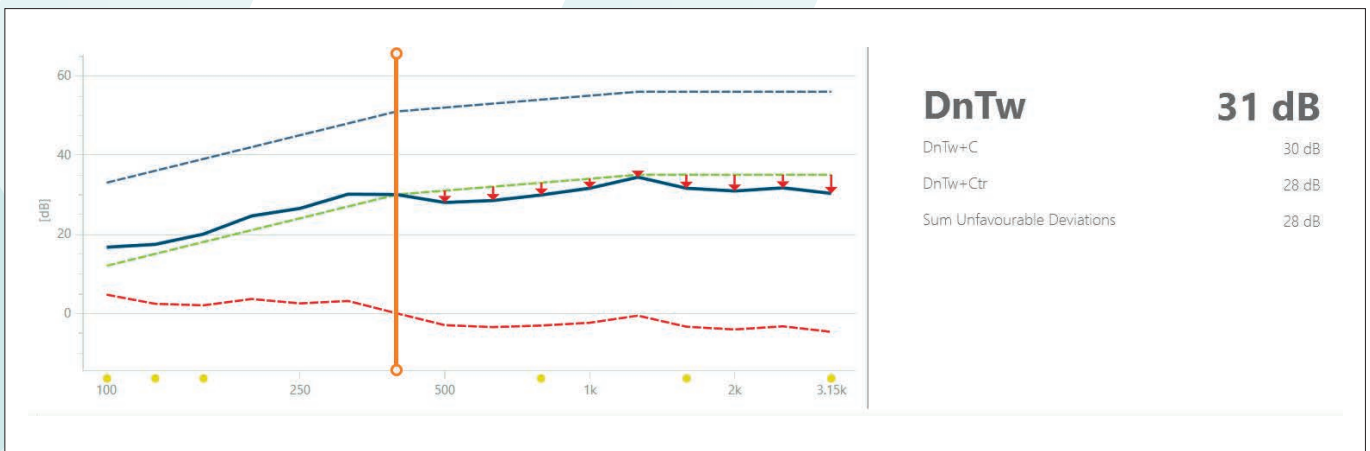
Below:
Directional response at 1 and 2 kHz of the dodecahedron speaker

the two speakers. The standard deviation is a measure of variation between measurement positions. The Mackie, which has an acoustic dispersion of 90° horizontally and 80° vertically had seven standard deviation warnings in bands from 500 to 3150 Hz while the dodecahedron speaker, which is omni-directional (see Figure 3) only had three. [P44](#)





Above: Figure 4: Test result using PA speaker



Above: Figure 5: Test result using dodecahedron speaker

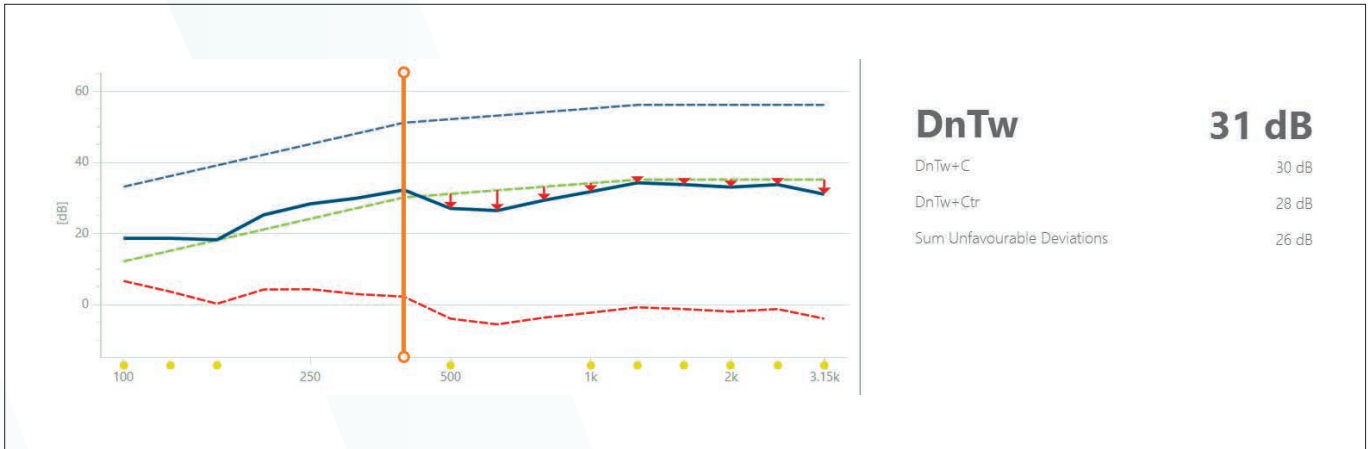
The warnings which are shown as yellow dots can be seen in Figures 4 and 5.

The solid blue line is the result, the dotted blue line is BREW reference criteria, the green dotted line is the shifted curve and the red dotted line is the deviation of the result from the shifted curve.

For comparison we also used an extension rod to perform a moving microphone measurement with the dodecahedron speaker. Again, the DnTw + Ctr was 28dB. However, this method was significantly quicker than the discrete points method. We measured a 20 second sweep for each of the speaker positions. The L1 (source) and L2 (receive) measurements were completed in about four minutes including moving the speaker, compared to nearly 15 minutes for the discrete points. The same method was used for all the background (B2) and reverberation time (T2) measurements. All three sets of tests had the same quality warnings for short reverb time in the three lowest frequency bands.



Above: Figure 6: Moving microphone method with extension rod



Above: Figure 7: Test result using moving microphone method with dodecahedron speaker

The conclusions

To conclude, there was not as much difference in the results as expected, but this was just one example. Further work would be beneficial to experiment with a range of room sizes, partition types and speaker orientations. We can see that in this case there is an impact from the high frequency directionality of PA speaker but it has not changed the result of the sound insulation test.

It is also worth noting that measurement equipment manufacturers will perform factory conformance tests on their speakers to ensure their specification is met. PA speaker manufacturers will usually perform quality checks but this would not have the same traceability to national standards. This could provide additional confidence in the repeatability of results.

An aside to the original remit is that the moving microphone method is a more time efficient technique than measuring discrete points. It also removes the L1 and L2 standard deviation requirement from an assessment as each source position is only measured with one longer average.

Overall, this assessment was inconclusive but it has provided some excellent pointers to futures studies. 🌀



CIEH Noise Management Conference

The Chartered Institute of Environmental Health (CIEH) held its annual Noise Management Conference on 29 and 30 September 2022, produced in association with the IOA and the Noise Abatement Society.

By Mark Hope, Senior Policy and Public Affairs Executive at The Chartered Institute of Environmental Health



This online conference (sponsored by Campbell Associates and RHE) was chaired by Stephen Turner, Immediate Past President of the IOA and the agenda addressed the latest issues around noise control and management in the industry today.

One of the most striking aspects of the conference was the turnout. Around 200 people attended, including many environmental health officers from local authorities.

Another key feature was the interactivity of the sessions. Delegates were able to contribute through the chat and the Q&As. Speakers stayed on after their session to deal with questions that could not be answered in the time available.

Conference sessions and speakers

In the first session delegates were updated by Cerise Reynolds, a policy official from the Noise and Statutory Nuisance Team at Defra, and James Trow, Managing Director, Noise Consultants Limited, on the latest progress in the development of a noise modelling system. Computer technology is being deployed to construct a geospatial model of the country – the aim is to develop a model that, as well as meeting statutory requirements, will provide noise level and exposure data in a way that enables users to manage noise efficiently.

Dr Matthew Aylott, Electrification of Heat Policy Advisor at the Department of Business, Energy and Industrial Strategy, then discussed in detail the management of noise emissions from heat pumps.

John Pointing, who is a barrister and a legal partner at Statutory Nuisance Solutions, gave a thought-provoking talk entitled *When is noise a nuisance?* He contrasted the vagueness of the common law on nuisance with the precision of Section 78 of the Police, Crime, Sentencing and Courts Act 2022.

John's talk was complemented by talks from Dani Fiumicelli and Tim Everett. Dani, an acoustic consultant from Vanguardia, looked at the range of roles of local authorities that involve responsibility for noise control and discussed how they exercise their duty to investigate. Tim, a trainer and researcher in environmental health law, considered the significance for noise regulators of the Human Rights Act 1998.

John and Tim were joined by Somayya Yaqub, Head of Corporate Health and Safety, London Borough of Ealing Council, and Trevor Ford, Team Leader –

Environmental Protection and Licensing, Ashford Borough Council, for a fascinating discussion of the impact of Covid on noise complaints. Issues raised included whether complaints had increased because of reduced tolerance or changed

circumstances, and the impact on complaints of cultural factors.

On day two of the conference James Healey, Director of Overheating and Acoustics, AESG, discussed new building regulations for ventilation and heating. He emphasised the need to understand the outside to inside sound insulation performance of ventilation systems, the need for virtually all residential sites to include a noise exposure assessment to meet the requirements of Approved Document O (which sets standards for reducing overheating risk) and the need for environmental health to interact with building control.

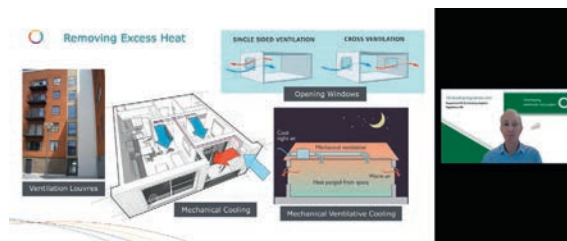
Colin Cobbing, Director, Pinnacle Acoustics, then gave a talk on *Professional Practice Guidance on Planning and Noise: New Residential Development* (ProPG). He emphasised the importance of good acoustic design as set out in ProPG and discussed what should be included in acoustic design statements, giving practical examples of acoustic design measures.

Grant Walters, Senior Consultant, Anderson Acoustics, discussed the sound of Transport for London's electric bus fleet. Dr Anna Jackman, Lecturer in Human Geography, University of Reading, gave a presentation on drone noise (in which she gave delegates an opportunity to express their views on how it could be managed). Jennifer Clayton, Area Intervention Manager, Blackpool Council, discussed the impact of defective sound insulation in housing on noise complaints.

Conference 2023

After such an informative conference this year, anyone with an interest in noise control and management should feel encouraged to come along next year!

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Lower noise, vibration and dust solutions for angle grinding – recent HSE research

Hand-held angle grinders are widely used across a number of sectors, and real-use Hand-Arm Vibration (HAV) measurements on angle grinders show upper quartile values in the range 7-9 m/s² (HSE L140¹). This means that there can be a risk of ill health for operators regularly using these machines for more than 20-40 minutes per day.

By Antonia Hawker, MIOA, Exposure Assessment and Control Scientist at the HSE Science and Research Centre



A high number of HAV syndrome incidents in the steel frame fabrication sector are reported and investigated under RIDDOR (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013).

Grinders typically produce noise levels of around L_{Aeq} 90 – 95 dB(A), so are significant contributors to occupational noise exposure.

In addition to HAV and noise, many power tool users are also exposed to other physical hazards including dust. Methods used to control dust, such as the use of water suppression systems, do not contribute to mitigating the effects of HAV or noise.

The most effective way of controlling exposures from grinders is to reduce or eliminate

the use of these machines. HSE researchers have undertaken a project which has investigated alternative processes to grinding as well as methods designed to reduce emissions from grinders. The techniques investigated may also result in reducing some of the other safety risks that are associated with using these machines, such as lacerations, eye damage, amputation of fingers and fire risks due to the ejection of hot debris during metal grinding.

Method

A selection of angle grinders, attachments and wheels were identified that could potentially reduce vibration, noise and dust for three activities where grinders are commonly used. The activities were: grinding, bevelling and

cutting. Specialist machines were identified for bevelling and cutting (bevelling machines and rebar cutters respectively). In addition, two angle grinders were tested: an angle grinder with a built-in auto-balancer and a standard angle grinder with anti-vibration handles. For each task, each combination of wheel and machine were repeated five times with vibration, noise and dust measurements made simultaneously. The wheels tested were:

- standard grinding wheels;
- flap discs;
- ceramic discs;
- fibre discs used with a rubber backing pad;
- standard cutting discs;
- diamond discs; and
- carbon discs.

All products tested were commercially available for purchase or hire in 2020.

Findings

For all tasks there are alternatives that could reduce exposure to vibration, noise and dust when compared to standard wheels and angle grinders. The tests on the specialist machines showed that although they may produce higher levels of HAV, they can significantly reduce the time taken to complete the task, and therefore reduce the exposure overall. For example, although the bevelling machines tested produced nearly twice the vibration level, they completed the task in a tenth of the time.

For the grinding task, it was found that the fibre disc and rubber

backing pad produced the lowest vibration and completed the task in the quickest time. The operator commented that this wheel and backing pad felt very smooth to work with and produced a very good finish. The flap disc produced the lowest noise, however the operator commented that a flap disc is not ideal for grinding off welds and instead would be used to finish. The ceramic disc produced the lowest amount of dust. When the standard angle grinder was used with anti-vibration handles it was shown to consistently reduce the vibration regardless of the wheel used.

For bevelling, the three bevelling machines were more efficient than a standard angle grinder and produced lower levels of noise, vibration and dust. The bevelling machines produced negligible amounts of dust due to the nibbling action of the machine on the metal rather than a grinding action. However, the operator commented that due to the high cost of the bevelling machines he would not purchase one unless his only job was to put bevels on sheets of metal.

For cutting, the lowest levels of vibration and dust were produced when using a diamond disc. However, this disc was inefficient at completing the task and, in some cases, did not cut the whole way through the rebar in the measurement period. The lowest noise and the quickest time were measured when using the carbon disc. An alternative machine to the angle grinder for cutting is a rebar cutter and this was shown to produce the lowest levels in all emission categories. The rebar cutter did not produce any measurable dust due to its compression action and the operator commented they could not feel any vibration through the handles. Tables 1 and 2 show a comparison of costs between all consumables and tools tested. Overall emission comparisons can be seen by activity in Tables 3 to 5.

References

1. Health and Safety Executive (2019), Hand-arm vibration. The Control of Vibration at Work Regulations 2005, Publication L140
2. Health and Safety Executive (2021), Controlling Noise at Work 2005, Publication L108

Comparison of costs

Below:
Table 1: Cost of the different wheels used in testing

Wheel	Cost per disc (£)
Standard grinding disc	0.42
Standard cutting disc 230 mm	2.69
60 grit flap disc	6.29
Standard cutting disc 125 mm	1.39
Carbon cutting disc	2.05
Diamond cutting disc	14.99
Fibre disc	1.35
Rubber backing pad	15.49
Ceramic grinding disc	3.65

Overall emission levels

Overall lowest emission devices for each activity are shown in Table 3 for grinding, Table 4 for bevelling and Table 5 for cutting.

Below:
Table 3: Lowest emission levels for each disc for grinding

Wheel	Lowest vibration	Lowest noise	Lowest dust	Quickest
Standard disc				
Flap disc		✓		
Fibre disc and rubber backing pad	✓			✓
Ceramic disc			✓	

Below:
Table 4: Lowest emission levels for the bevelling machines

Machine	Lowest vibration	Lowest noise	Lowest dust	Quickest
Standard angle grinder				
Bevelling machine 1			✓	
Bevelling machine 2	✓		✓	✓
Bevelling machine 3		✓	✓	

Below:
Table 5: Lowest emission levels for the different cutting options

Machine/Wheel	Lowest vibration	Lowest noise	Lowest dust	Quickest
Standard wheel				
Carbon wheel		✓		✓
Diamond wheel	✓		✓	
Rebar cutter*	✓	✓	✓	✓

*Rebar cutter was the lowest in all categories when comparing as an alternative machine to an angle grinder

Conclusions

When undertaking risk assessments for this type of work, the priority should always be eliminating the risk altogether, but this project has proven that alternative machines to angle grinders can reduce exposure to HAVs, noise and dust and should be considered. It is also important that duty-holders take a holistic view when looking at emissions and consider the overall reductions that can be made.

HSE guidance on noise and HAV (L140¹ and L108²) is highly relevant for duty-holders on tool selection. It is important for duty-holders to identify efficient machines for the job, avoiding any high noise or vibration models and then manage the remaining noise or vibration risk. ©

Below:
Table 2: Costs of the different machines used in testing

Machine	Cost (£)
125 mm angle grinder	54.99
230 mm angle grinder	99.99
125 mm angle grinder with built in auto-balancer	189.00
Bevelling machine 1	829.00
Anti-vibration handle	16.99
Bevelling machine 2	1290.00
Bevelling machine 3	2200.00

This publication and the work it describes were funded by the Health and Safety Executive (HSE). Its contents, including any opinions and/or conclusions expressed, are those of the authors alone and do not necessarily reflect HSE policy.

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PLG – progressing political engagement

The IOA Parliamentary Liaison Group (PLG) is continuing to work to raise the profile of the importance of acousticians with politicians and policy makers. The PLG is developing a plan to increase political engagement to the end of 2023, and thanks those members who have already offered to support this initiative by liaising with their own MP.

The PLG wants to draw wider attention to the significant societal and health benefits of the work of professionals in this sector. At a time of accelerating technological advancement, the potential acoustic impacts of the roll-out of emerging and novel technologies must be fully considered. We want to see measures properly implemented to manage noise effectively, protecting human health and the environment and avoiding significant adverse impacts on soundscapes.

To support this work, a series of briefings are being drafted – to highlight the opportunities and risks of new technologies for the aural environment. The briefings aim to make the very technical issues that acousticians work with more accessible to a non-technical audience, including politicians, policy makers, journalists and anyone else interested in or affected by the topic covered.

Members of the PLG are already having an impact

We continue to monitor activity in Parliament to identify emerging issues and those politicians taking an interest in issues

around acoustics. We also monitor consultations any of the UK government administrations are undertaking and which may impact on acoustics or the sound, noise and vibration environment. That enables us, through our various specialist groups and relevant regional branches, to provide authoritative and informed responses where appropriate.

IOA Briefing Notes

Our briefing on drones was published in the summer. Notes have been drafted on air source heat pumps (both for public and professionals) and also on acoustic cameras will be published soon. Further topics are being considered, including the acoustic classification of buildings and acoustics in schools. Briefings are drafted by members with specialist knowledge in the field.

We are now looking for someone who can lead on drafting a briefing on audio deepfakes – so please get in touch if you are able to help with this note.

While the PLG is being successful in identifying issues, we welcome the assistance of members in work to support and promote our profession – so please keep

Above:
Can you lead on drafting a briefing on audio deepfakes for the PLG?

in touch with:

- any emerging issues the group should be aware of;
- suggestions for briefing topics;
- if you would like to (or already are) liaising with your MP; and
- can lead on drafting a briefing on audio deepfakes.

Contact: parliament@ioa.org.uk

IOA members commended in Parliament

As Parliament reopened for business following the break for party conferences, IOA members were commended in Parliamentary debate for their work. Hansard for 13 October 2022 records the acknowledgement of Dr Kieran Mullan, MP for Crewe and Nantwich, of the support he has received from President Alistair Somerville and Chair of PLG Peter Rogers. Turn to page 68 for full details. ©



About the author:
Mary Stevens supports the IOA to bring acoustics to the attention of policy makers.

Environmental acoustic criteria for sustainable developments — what do we mean by sustainable acoustics?

Richard Collman and Mike Hewett consider how planning conditions relating to acoustics appear to be far from universally understood.

The Government's planning guidance issued in the early 2010s strongly advocated the principle of sustainable development. Both NPSE in 2010 and NPPF in 2012 required acoustic impacts to be considered within the broader context of their impact on other potential sustainability issues.

This had significant implications for how planning conditions relating to acoustics should be derived and implemented. However, this guidance appears to be far from universally understood and has been slow to be adopted across the country.

The concept of sustainable development is a large and complex one balancing many, often conflicting, issues. How acoustics fits into that balance is therefore also a complex issue with no simple answers.

Noise clearly can have a detrimental effect on quality of life and health, but we cannot and should not expect to live in 'silence', in fact many people would positively prefer not to.

There are considerable sustainability advantages to having potential noise emitters such as places of employment, food retailers or leisure facilities located close to where people live. This can reduce the need for, or length of, car journeys for commuting, shopping and leisure and can provide a focus for balanced and sustainable communities. In addition to reduced emissions, fewer car journeys can also contribute to lower ambient noise levels.

Above: Employment land close to dwellings, using quieter offices etc. as a barrier, with potentially louder uses further from dwellings (Image courtesy of Google Earth)



It is vital that people living close to commercial sources have their amenity properly protected from the impacts of noise. However, the sustainability advantages described above are lost if sound from these sources is controlled to an unnecessarily low level, resulting in the selection of oversized or heavily attenuated equipment with consequential adverse environmental impacts such as the carbon cost of materials used and increased energy consumption.

When Richard Collman (Snr) established Acoustical Control Engineers (ACE) in 1972, one of his aims was to ensure that people were properly protected from the potentially harmful and annoying effects of noise while also endeavouring to offer practicable and efficient noise control solutions. This was based on the recognition

that setting and achieving unnecessarily low noise level limits harms the latter without providing any additional benefit to the former. Nearly 40 years later, Government planning policy caught up with and promoted this approach.

For 50 years Acoustical Control Engineers & Consultants (ACEC) has consistently advocated this 'highest suitable level' approach, whereby an assessment is used to identify the highest sound level that can be emitted by a source without an improper impact on amenity. The word 'suitable' was selected to avoid words that imply undeliverable promises such as 'acceptable' or 'justifiable' or expressions that create hostages to fortune such as 'avoid a nuisance' or 'address/resolve the complaints'. This principle is now becoming widely recognised as a fundamental part of acoustic design. P52

Guidance for sustainable acoustic criteria

NPPF and NPSE strongly advocate sustainable development. The associated online Government planning document (www.gov.uk/guidance/noise--2) provides comprehensive guidance regarding how noise should be considered holistically as part of the planning process and states that ‘*Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.*’ This guidance makes it clear that the impact of noise from a development should not be considered in isolation but weighed up as part of the overall balance of numerous competing considerations. It is not appropriate to aim to achieve unnecessarily low noise levels because this provides no additional benefit but can create other significant adverse impacts.

BS 4142 has become the primary standard for assessing the impact of commercial and industrial sound and the current (2014+A1:2019) version contains the tools necessary to include some of these sustainability issues within the context of the assessment. However, the standard has gone through a lengthy process of evolution to reach this point and is often incorrectly applied in the selection of noise criteria.

Ironically, although Richard Collman (Snr) was a member of the BSI committee responsible for creating BS 4142: 1967, ACEC spent much of the next 40 years resisting its application to many of the projects with which they were involved because it would have resulted in unnecessarily stringent criteria, particularly for plant operating on a 24/7 basis such as refrigeration systems. In such cases; the sound level outdoors was of relatively little significance in comparison to achieving good acoustic conditions inside nearby bedrooms with windows open, during warm summer nights.

The 1967 version of BS 4142’s methodology compared the sound being assessed with a corrected criterion, which was based upon the background sound in the area (a ‘typical low value’ assessed by eye) corrected for the nature of the area, how long the industrial facility had

been operating in the area and the expected times of day and year that the source would be in operation. The output of the assessment was the likelihood that complaints would arise as a result of the sound. The 1967 version continued in use for 23 years until a major revision in 1990. During this period the standard became the primary assessment method for industrial noise and conclusions drawn from it expanded beyond an assessment of complaint likelihood to include assessment of impact and nuisance.

The 1990 revision changed the methodology significantly introducing the concept of comparison between a rating level for the source of the noise based upon its L_{Aeq} at the receptor corrected for certain audible characteristics and a background noise level based on the LA90 measured in the absence of the source.

The corrections for the nature of the area and the time for which the source had been present were removed but the standard did state that ‘*Other factors, such as the local attitudes to the premises in question may also have an effect but these cannot be included in this assessment procedure.*’ This continued to recognise that the context in which the sound was experienced would affect the significance of its impact, but declined to take this into account, presumably due to the complexity of attempting to do so. This comment was absent from the 1997

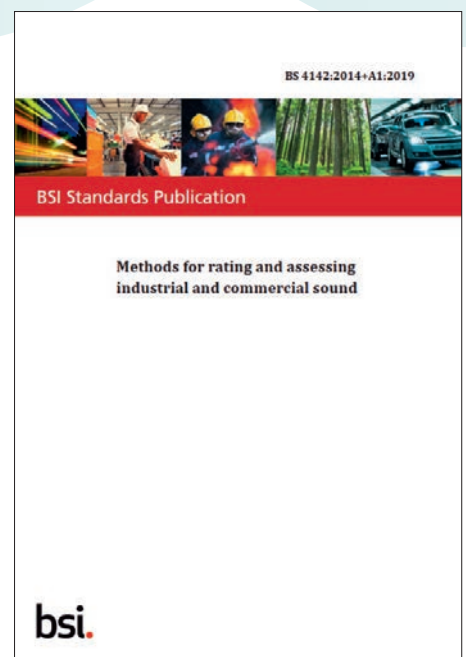
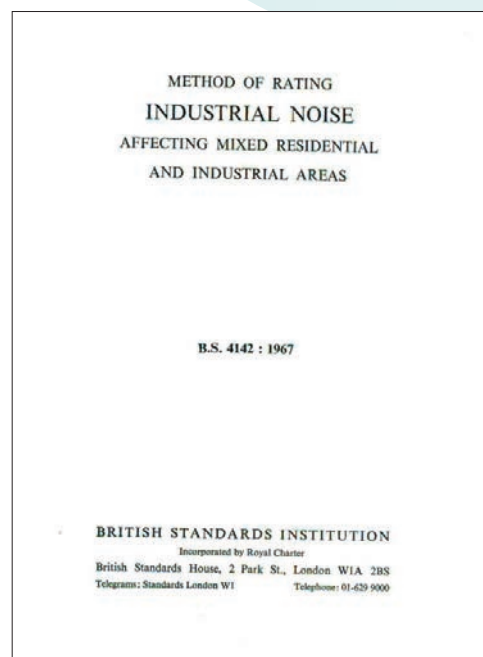
revision, which was similar to its predecessor in most other respects.

The 1990 version stated clearly in its scope that the method was not suitable for assessing noise where background noise levels were very low (less than 30 dB LA90), the 1997 version stated the same and added that it was not suitable where rating levels were below 35 dB LA_r.

The outcome of the assessment in both the 1990 and 1997 versions was still expressed in terms of the likelihood of complaints, with a rating level 10 dB below the background noise level being an indication that complaints were unlikely, a rating level 10 dB above the background sound level being classed as an indication that complaints were likely and a rating level 5 dB above the background being of marginal significance. However, the use of the standard to draw conclusions other than the likelihood of complaints developed further and these three, very simplistic, level difference values became embedded in many aspects of acoustic criterion derivation. Unfortunately, this resulted in criteria, which are often much more stringent than is necessary to protect amenity or address potential noise impacts.

Concern about this and the resulting detrimental effects on development sustainability and viability led Richard Collman (Jnr) to become a member of the drafting panel for the 2014 revision of BS 4142. **P54**

Below:
The evolution of BS 4142



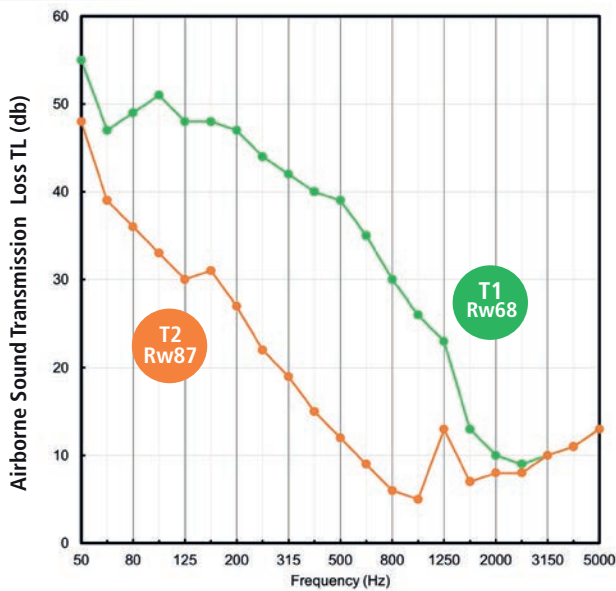
Akustik + Sylomer® floor mounts and Acoustic hanger Tests

Test results for the **Akustik + Sylomer® Floor Mount 25** on a 150mm concrete slab, achieving values of $R_w=68$ and $L_{nw}=41$.

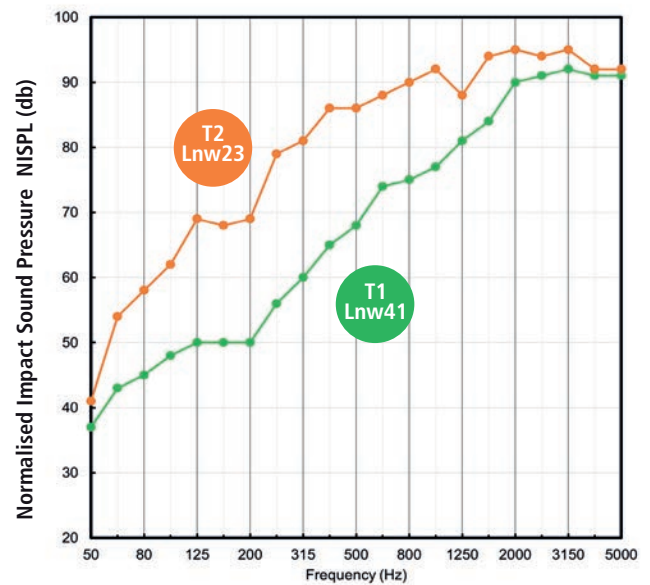
Adding the **SRS25 + Sylomer® Acoustic Hangers** to the assembly allows us to achieve values of $R_w=87$ and $L_{nw}=23$.



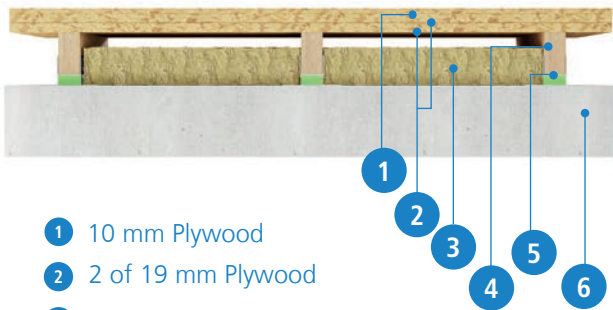
Airborne Sound Transmission Loss



Normalised Impact Sound Pressure Levels



T1 Akustik + Sylomer® Floor Mount 25



- 1 10 mm Plywood
- 2 2 of 19 mm Plywood
- 3 89 mm Glass Fibre Insulation
- 4 2 x 89 mm Wooden battens
- 5 67.5 mm Akustik + Sylomer Floor Mount 25
- 6 150 mm Precast Concrete Slab

T2 Akustik + Sylomer® Floor Mount 25 and SRS25 + Sylomer® Acoustic Hanger



- 7 276 mm air gap SRS25 + Sylomer Hanger
- 8 22 mm Furring Channel
- 9 89 mm Glass Fibre Insulation
- 10 2 of 16 mm Type X Gypsum Board



To inform this he reviewed the night-time acoustic assessments for a large sample of operational foodstores and found that, in the majority of cases, the rating level from plant exceeded the background sound level during the night by more than 10 dB. Therefore, BS 4142: 1997 outcomes would indicate that complaints would be likely for many of these stores. However, in reality, no complaints had been made, indicating that for this particular scenario the method resulted in an overstatement of impact and the context would indicate that the impact was low.

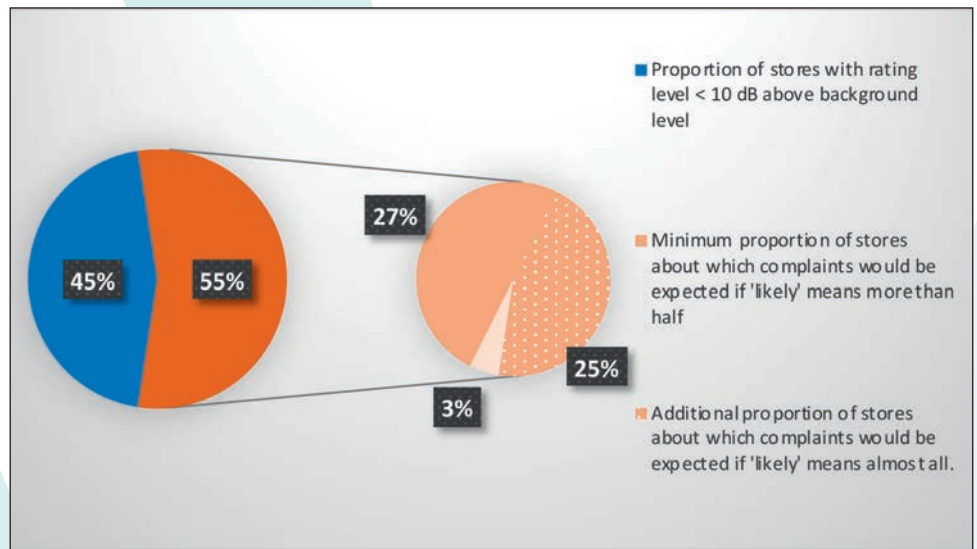
Figure 1 shows that at 55% of the stores the assessed rating level was at least 10 dB above the background level. The exact meaning of 'complaints likely' was not defined in any version of the standard, but if it is taken to mean that complaints would be expected half of the time, then complaints would be expected at 27% of the stores. However, if 'complaints likely' means complaints would be expected the vast majority (e.g. 95%) of the time, then complaints would be expected possibly at a further 25% of the stores. Therefore, if the methodology was valid in this context then complaints would be expected at between 27% and 52% of the stores.

Figure 2 shows a similar analysis but with a 5dB character correction applied to all sites simply because the source is mechanical plant. Although this is not a valid reason to apply a correction on its own, as the sound perceived at the receptor may not have any characteristics which meet the definitions in the standard, we have found that various parties incorrectly apply such a correction by default. In this case, if this were valid, complaints would be expected at between around 35% and 67% of the stores.

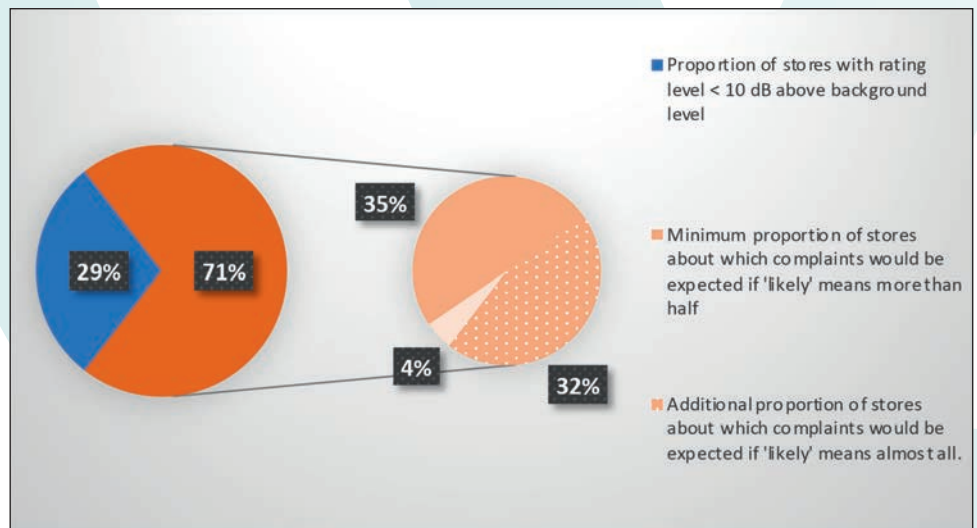
This indicates that if the difference between rating and background levels was a reliable indicator of the likelihood of complaints, then complaints would be expected for at least 27% of the stores. However, no complaints were received, indicating this is not a reliable indicator.

Amongst numerous changes to the 2014 version of the Standard, were the following:

- The Standard no longer attempts to indicate a likelihood of complaint and makes it clear that



Above: Figure 1: Proportion of stores with rating levels higher or lower than 10 dB above background and pre-2014 BS 4142 likelihood of complaint



Above: Figure 2: Proportion of stores with rating levels (including a blanket 5 dB character correction) higher or lower than 10 dB above background and pre-2014 BS 4142 likelihood of complaint

the comparison of background and rating levels provides only an 'initial estimate of the impact' of the sound being assessed.

- The Standard then requires that this initial estimate of impact must be reviewed, taking account of the context in which the sound will be experienced by a listener.
- The specific exclusion of low background sound level situations has been removed.
- There is guidance including references to other standards that may provide useful contextual information in such situations. For example, BS 8233 is referenced for situations where assessment of the impact of sound indoors might be more appropriate.

As a result of these changes BS 4142 is now a tool which can be effectively used to determine impacts appropriately and assist in the promotion of sustainable development.

However, even eight years after the introduction of the BS 4142:2014 it is still all too common to see proposed noise criteria from local authorities and acoustic consultancies which are based on simple BS 4142 level differences, such as '10 below background' or '5 dB below background'. Not only are these criteria significantly lower than the level at which BS 4142 would give an initial estimate of a likely adverse impact but, more importantly, they ignore the [P56](#)

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consideration of context altogether. It is therefore likely that in most cases they result in levels of noise control far in excess of those necessary to properly protect the amenity of those living nearby.

Implementation of this excessive noise control comes at a significant financial, environmental and sustainability cost.

What is context?

What is meant by context depends upon the context in which it is used. For a sound source, this will include factors such as the nature of the sound it produces, operational times and duration, the need for the source, and impact of reducing the sound emitted e.g. cost, visual impact, carbon footprint etc. All of these aspects require further consideration, for example the nature of the sound the source produces must be considered in comparison with that of the environment in which it emits sound. An air conditioning unit may sound innocuous in an urban location where numerous other air conditioning units are already operating but be very noticeable in a rural location with no similar sources in the vicinity.

For a person exposed to the sound, the context will include factors such as their location, activity, characteristics of the sound to which they are exposed (both from the source and residual sound), and time of the day. Someone in their garden during the day has different expectations and sensitivity from the same person trying to get to sleep during the night, although particularly in the latter case, guidance such as BS 8233: 2014 is more relevant than the difference between rating and background sound levels outdoors.

A listener's reaction to a specific sound may vary greatly depending solely on the conditions in which the sound is experienced. For example, someone may enjoy listening to a musical performance they attend but complain if neighbour plays the same music when they are back at home and going to sleep.

It helps to bear in mind that people do not hear decibels, they experience sound and that the same sound may be positively or negatively received, depending solely upon the context in which the listener experiences the sound.



Above:
Air source heat pump in a garden

Below:
Urban location with multiple existing AC units



What are the costs?

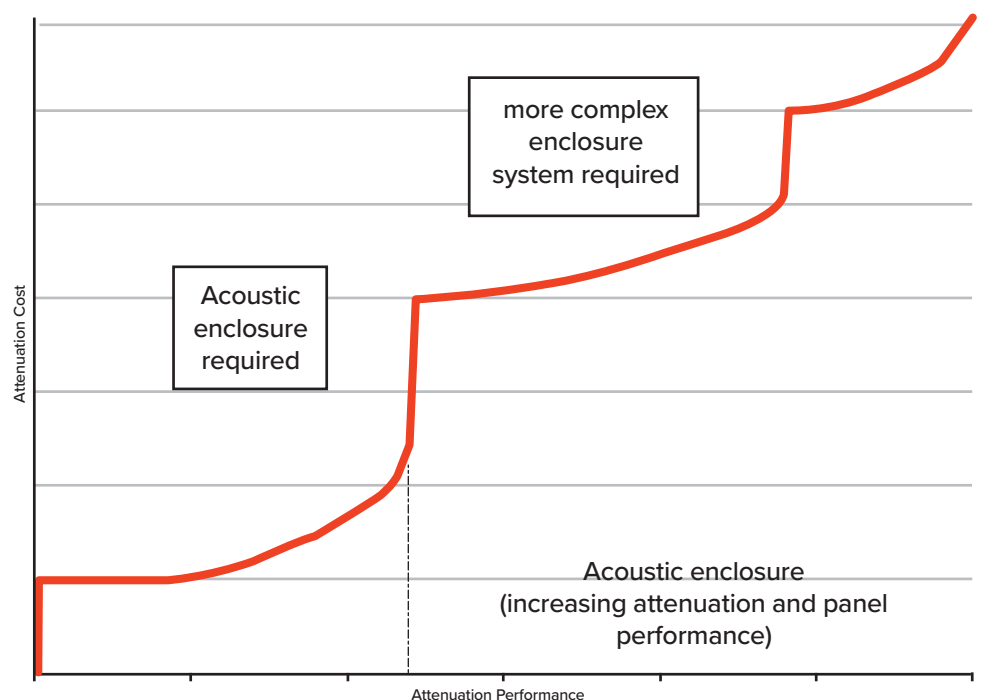
The relationship between costs and performance of acoustic attenuation systems is non-linear and stepped. For example, an acoustic barrier may be the simplest way to attenuate the sound transmission path from source to receiver. An effective acoustic barrier will provide at least circa 5 dB attenuation and incur a certain cost. Spending less than this minimum may not provide proportionately less attenuation, instead being largely a case of 'all or nothing'. Increasing the size of the acoustic barrier may provide more than 5 dB attenuation and the cost will increase, but the rate of increase in attenuation will typically be less than the rate of increase in cost. There is also an upper limit to what an acoustic barrier can realistically achieve. To further increase the attenuation will probably necessitate an acoustic enclosure, which will, in turn, result in a further step increase in the cost. Once again, the acoustic enclosure's attenuation can be increased, but the rate of increase in attenuation will typically be less than the rate of increase in cost. As the required performance increases further, the enclosure design, construction or materials will probably change, further increasing the cost and sustainability impact of the attenuation system. At some point a more complex enclosure structure will be required leading to another step increase in costs.

Figure 3 shows that a difference in required attenuation of only a couple of decibels, such as when an acoustic barrier's performance is no longer sufficient, may make the difference between totally different attenuation systems being required. **This highlights how an unnecessarily stringent criterion, which crosses this boundary will result in significant unnecessary costs and adverse sustainability impacts, whilst providing no additional benefit for listeners.**

At ACEC we are fortunate to be able to bring our experience to bear as both acoustic engineers and acoustic consultants. This means that when, as acoustic consultants, we develop acoustic specifications, we understand the ease or difficulty and costs of achieving them. Similarly, as acoustic engineers, we are not simply working to [P58](#)



Below:
Figure 3:
Relationship
between cost
and performance
of attenuation



achieve an acoustic specification, imposed by others, but are often able to achieve the required outcomes in more cost effective and sustainable ways.

We calculated that for one national convenience food retailer using default criteria based on an arbitrary margin below the outdoor background sound level, rather than bespoke criteria (highest suitable level) using a contextual assessment, equated to a potential overspend of circa £1M per year on unnecessary noise control equipment. In addition to this substantial financial cost it is important to consider the associated carbon costs due to the materials used (in attenuators, barriers and oversized equipment), transportation, and operational energy consumption. The excess attenuation also created other problems such as the increase in the physical size of the plant resulting in difficulties with locating it, visibility issues, increased land take up and reduced distances to receptors. For a local convenience store we estimate that 10 dB of excess noise reduction requirement equates to an average overspend of around £12,000 in attenuation alone.

There is very significant uncertainty in the data, but we estimate that an acoustic enclosure to attenuate the refrigeration plant for a convenience foodstore by 20 dBA may create around four tonnes of embodied carbon and that the ongoing energy required to provide the necessary cooling airflow through the attenuation system will equate to around an additional two tonnes of operational carbon every year. So over a 10-year period this equates to around 24 tonnes of carbon. For comparative purposes this is roughly equivalent to one person flying around the world six times!

Conversely, an acoustic barrier designed to provide 10 dBA of attenuation may result in around a quarter of the embodied carbon of an enclosure, and negligible ongoing energy consumption if the barrier does not affect the refrigeration plant's airflow. However, this still equates to around one tonne of embodied carbon. **If no attenuation is required to achieve suitable acoustic conditions, then none should be used.**

In many cases, acoustic enclosures are fitted to air conditioning (AC)



Above:
Convenience foodstore plant acoustic enclosure



Right:
Convenience foodstore plant acoustic barrier

units which are then required to move the associated airflow against the additional resistance imposed by the enclosure. This reduces the AC unit's airflow, forcing it to work harder, reducing its capacity and, on occasion, causing overheating and failure. In most cases the effect is not so catastrophic, so the adverse impacts remain unnoticed. However, if the unit's airflow is reduced by say 25%, this equates to an increase in energy consumption of around 7% which, for an average convenience foodstore probably equates to around 1 tonne of additional operational carbon per annum. **Air conditioning outdoor units should only be enclosed or their airflow impeded when it is really necessary to do so.** The selection of 'low noise' equipment or running oversized equipment at reduced loads are often cited as an alternative to enclosure of standard appropriately sized units. We have not been able to obtain specific information, but it is clear that the inappropriate use of 'low noise' equipment for a typical convenience foodstore will create several tonnes

of operational carbon every year.

As an extreme example of unnecessarily stringent acoustic criteria, we have encountered one situation where an acoustic report specified that a refrigeration condenser should produce no more than 0 dBA at 10 m. Aside from the obvious absurdity of this in the context of a real-world acoustic assessment, it should be borne in mind that structure-borne energy transmitted along the pipes from the remote compressors in the plantroom would probably result in a higher sound power level from the body of the condenser itself than its fans produce.

Although this article has focused on retail refrigeration and air conditioning systems, the same principles apply across the entire noise control field. Again, relatively little data is available and there is considerable uncertainty in it, but we estimate that the UK noise control engineering industry probably embodies somewhere around 50,000 tonnes of carbon every year, equating to around 30 long haul jet aircraft global circumnavigations.

That is in addition to the ongoing operational carbon due to previous years' attenuation systems already in place. ☹️

This article is the third in the series written by Richard Collman and Mike Hewett to celebrate Acoustical Control Engineers 50th birthday.

About the author:

Richard A Collman BSc (Jt. Hons), CEng, MIOA, Tech IOSH is Managing Director of Acoustical Control Engineers Ltd and Acoustical Control Consultants Ltd having joined the company in the 1980s and has specialised in the measurement and assessment of sound from industrial and commercial plant for over 35 years. He pioneered the use of digital instrumentation for short duration consecutive logging techniques. As an expert on sound from refrigeration and air conditioning plant he represented the Institute of Refrigeration on BSI committees responsible for various acoustic standards.

About the author:

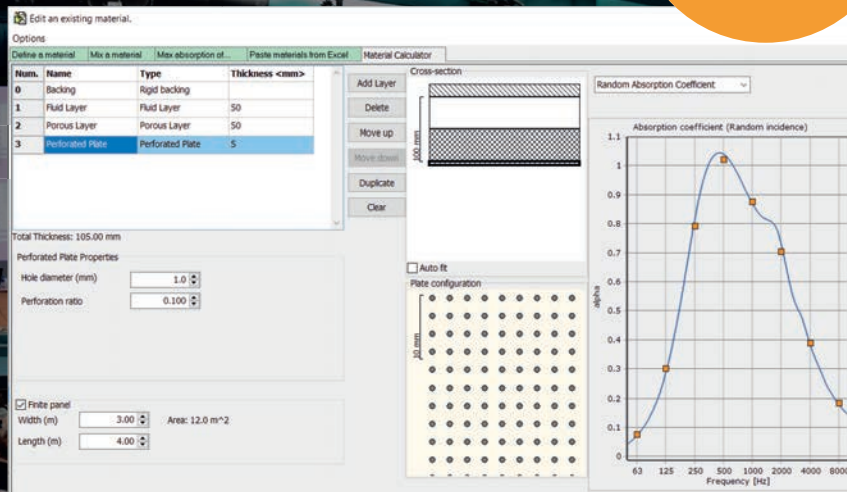
Mike Hewett MIOA is Principal Acoustician with Acoustical Control Consultants Ltd having joined the company in 2021 bringing more than 30 years' experience of Acoustic consultancy. Mike's particular expertise is in the assessment, prediction and control of noise and vibration from structures, plant and equipment. He is a former examiner for the Noise Control Engineering module of the IOA Diploma and a former Secretary and Chair Noise and Vibration Engineering specialist group.

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Acoustics engineering technician apprenticeships are GO!

The Acoustics Engineering Technician Apprenticeships Trailblazer Group is delighted to announce that the first cohort of apprentices have started at London Southbank University. This is a huge first step and we are extremely grateful to the Institute of Acoustics and Association of Noise Consultants for their continuing support.

By Richard Grove, Director | Europe at Inhabit

Above:
A group of the acoustic apprentices on the course at LSBU

London Southbank University has been instrumental in the development of this course.

Sammy Shummo, Group Director of Apprenticeships said: "This September London South Bank University started the first and only Acoustic Technician apprentice course in the country (<https://www.lsbu.ac.uk/study/course-finder/acoustics-technician-apprenticeship>).

"We are delighted to support an industry which is seeing growing demand for skilled acousticians. This course is one of a wide range that LSBU runs to train our students in the advanced skills they need to build successful careers."

The course

The two-year course equips apprentices with the practical and theoretical skills to develop a career in acoustics. Taught sessions include regulation and legislation, scientific and mathematic principles of acoustics, equipment and measurement techniques, traditional and modern calculation methods, with environmentally sustainable design principles woven through all knowledge areas. The skills learned in their studies will be directly applicable to their workplace, in turn developing the confidence to work on increasingly complex projects. On completion of the taught element, apprentices are eligible to apply for TechIOA, and on completion of the end point assessment apply for

AMIOA. They will also develop the necessary evidence to begin their path on towards Chartership, starting with EngTech.

The apprenticeship engages people early in their journey in acoustics, enabling employers to take advantage of the structured training programme offered by the apprenticeship and funded by the Government. The need for good acoustics in the built environment demands that the industry recruits more people with the necessary skills to respond to the challenges of the modern world, contributing to positive health and wellbeing and an environmentally sustainable future.

Trailblazer Group

Chair of the ANC and member of the Trailblazer Group, Russell Richardson, said: "The Acoustics Technician Apprenticeship represents a very welcome new way to join the acoustics industry, in a

sector which has always struggled to recruit sufficient numbers. There are fantastic employment opportunities for those looking to work within acoustics and the apprenticeship opens another door for that. The ANC strongly supports the new scheme and we look forward to many of our members taking on apprentices in the coming years.”

As part of a suite of developments planned for the 2023 intake of apprentices, the Trailblazer Group is working closely with LSBU to develop a hybrid teaching programme, making the apprenticeship accessible across England. In addition, we continue to work closely with the IOA to comply with Ofqual requirements for their registration as the official End Point Assessment Organisation (EPAO). Finally, the Trailblazer Group is seeking to develop a clearing system to ensure that all those who apply for apprenticeships are given maximum opportunity to be matched with those seeking to hire apprentices. We will be posting updates via the usual channels.

Recruiting apprentices

The process of recruiting an apprentice is easy and begins with a simple job advertisement. As apprentices begin their search now, it is vital that companies who are seeking apprentices across the whole of England advertise now. Supporting materials have been made available by the Trailblazer Group here <https://www.association-of-noise-consultants.co.uk/apprenticeships/> including example apprenticeship advertisements and example contracts.

It is important to acknowledge the support of the employers who hired the first cohort of apprentices. AECOM, AIRO, Arcadis, Arup, and Waterman Environmental have all taken this step to help trailblazing apprentices develop a career in acoustics.

AECOM acoustics technician apprentice, William Harris said:

“The acoustics apprenticeship has opened a new door for me. I was fortunate enough to be enrolled onto the scheme and so far, I’m having a very positive experience working mainly within the environmental acoustics group. The apprenticeship has given me the opportunity to apply the knowledge I’ve gained whilst learning, in addition to acquiring vital on the job training and experience.”

Apprentice, Marwaan El Halimi, said: “It’s a great way to learn more about the industry in which I work. I also develop new skills and gain work experience that will help me advance quicker than a graduate who has just completed their degree. There will be no tuition debt if you work and earn at the same time.”

These apprentices are not only the present, they are the future, and we wish them all the best of luck and industry support in achieving their goals! 🍀

National Apprenticeship Week runs from 6 to 12 February 2023
<https://www.nationalapprenticeshipweek.co.uk/>

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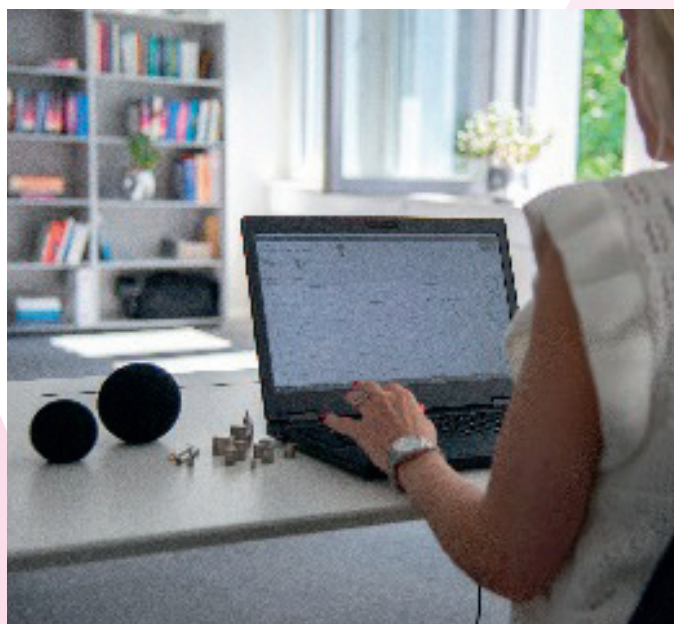
Anyone seeking to learn more about microphones can now use HBK's new Microphone Viewer.

The database includes sample records from more than 20 microphone cartridges and microphone sets. It helps users learn how microphones behave in different operating conditions, provides background information to support their decision when choosing specific models and acts as a handy reference tool.

Briel & Kjær microphone users have the added bonus of being able to import its data to the Microphone Viewer and start building their own database. They will be able to see the calibration data, including the type number, serial number and last calibration date, at a glance.

Users will also see the optimised frequency response curve, view responses (low-frequency, actuator, free field or random incidence) as well as responses with or without protection grid or other accessories, and at different degrees of incidence. Corrections such as free field, random incidence and pressure field, are shown in graph or table form. All the data from the table can be exported into Excel® for post-processing and printing.

The Microphone Viewer is available free to download on the company's website.



Rion software products make complex BS 4142 assessments easier

Managing the data from your BS 4142 survey can be a challenge but users can easily analyse data and drill down to the essential information using Rion's AS-60 Data Management and AS-70 Waveform Analysis software.

Users may have captured LpAF in 10ms increments or wave files with high sampling rates, which could be gigabytes of data and millions of data points; however, if they have used a Rion NL-52 with the NX-42WR wave recording option to acquire their data, users will have everything they need when they get back to their desk. Rion's powerful AS-60 and AS-70 software

packages allow users to: align waveform (audio) data with objective sound pressure level measurements, listen back to audio recordings, retrospectively calculate background and ambient sound pressure levels over 15-minute or one-hour reference periods, and carry out objective analysis of sound character. This includes preparing and processing the data for the reference method analyses of impulsivity and tonality if, after reviewing the audio recordings, the sound character requires closer attention. Just drag and drop the files from the NL-52's SD card into the software to get started.



Scientists celebrate vibration isolation results

When construction company, Bouygues, received a specification requiring a high level of isolation for a large electron microscope at the Cardiff Innovation Campus, the conventional methods of isolating equipment were insufficient. Bouygues turned to Mason UK, who designed and installed a bespoke system of air springs to isolate the electron microscope from vibration and meet the exacting requirements of the project specification.

The Cardiff Innovation Campus, once a disused railway yard is home to a large electron microscope. The campus location, therefore, is problematic for the operation of the microscope — imaging and analysis at the atomic level means that any external interference that causes a deviation greater than the dimensions of the atom can be a major problem. The new electron microscopy facility is located close to a busy road and just 75 metres from a passenger and freight line in use 24 hours a day. Early site surveys demonstrated that the vibration caused by passing trains would interfere with the proper functioning of the equipment and would be a limiting factor in the performance of the microscope unless the correct vibration isolation methods were put in place.

Acoustic consultant, Colin Gordon Associates, designed an especially onerous specification to ensure the proper functioning of the ThermoFisher electron microscope. The challenges of this project required considerable engineering including the construction of an exceptionally high mass and stiff foundation in addition to exacting passive vibration isolation measures.

The manufacturer of the equipment had determined the level of vibration



that would interfere with the correct functioning of the electron microscope. Anything above VC-E level vibration was not permissible. VC-E level is regarded as an extremely challenging criterion to achieve. VC-F and VC-G levels are appropriate for extremely quiet research spaces, but as these levels are often not possible to achieve in practice they are not recommended for use as a design criterion, only for evaluation. Bouygues began discussion with Mason UK in 2017 on how best to achieve this level of isolation.

Spring mounts are often specified to isolate mechanical and electrical equipment or protect sensitive instrumentation but there are some applications where they are insufficient. Air springs are specified in projects requiring very high levels of vibration isolation. They are self-levelling and have very little resonant response, therefore provide a high level of stability and higher levels of isolation than can be provided by rubber or spring isolators. Air springs typically achieve natural frequencies of sub 2Hz, but it is possible for well-engineered systems to go even lower.

For this project, Mason UK proposed a bespoke system of air springs to meet the level of isolation determined in the specification. The electron microscope would be mounted on a large concrete block (inertia base) which, in turn, would be separated from the ground using a system of air springs.

The system of air springs required a large pit in the floor, as the air springs are supported on top of columns for stability reasons. However, the system also had to work architecturally within the building, and so the maximum possible pit depth was a constraint that had to be worked around.

The electron microscope now sits on top of a large inertia base which can be raised by the system of air springs. The block itself weighs approximately 10,500 kg, with the additional weight of the microscope resulting in a total mass of 14,000 kg.

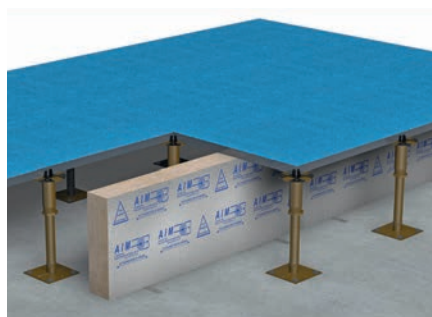
When the system is actuated via a remote control box, the air springs are pressurised and the inertia base and microscope is lifted from its supports. This action cuts out any transmission path for sources of vibration, meaning any vibration has to pass through the air springs. The low resonant response of the air springs ensures the equipment can be safely operated without any impact from sources of vibration.

Although the specification had required VC-E levels of isolation, the scientists who would be using the microscope were optimistically hoping for VC-G levels. Subsequent testing demonstrated that Mason's air springs not only surpassed the VC-E levels specified by the manufacturer, but in part even surpassed the VC-G levels the scientists were aiming for.

A I M Barriers address raised access floor fire safety concerns

A I M Acoustic & Insulation Manufacturing's Raised Access Floor Barrier is designed to prevent the passage of fire and smoke through underfloor cavities. By subdividing large uninterrupted cavities, the barrier provides up to 120 minutes insulation and integrity. It can also reduce room to room airborne sound through floor voids by at least 50db, says A I M.

Incorporating raised access floors, as means of providing space for services, such as electricity and data cables, is now standard practice in new builds and refurbishment projects, but the space



below the floor can risk the rapid spread of fire and smoke.

A I M's Raised Access Floor Barrier is designed for the subdivision of large uninterrupted cavities into smaller, more manageable fire compartments, slowing the spread of fire, allowing time for occupants to escape and to provide safe access for firefighting personnel. It has been tested to EN 1366-4 standards and to the principles of TR31 and provides up to 120 minutes integrity. An added benefit of the A I M Raised Access Floor Barrier is that it reduces airborne sound through underfloor voids. Acoustic tests to BS EN ISO 10848-2 (2017) show that it can achieve at least a 50db room-to-room airborne sound reduction when used in conjunction with a Kingspan Raised Access floor system. ☺

Voicing an opinion

Dr Philip Harrison was guest speaker at the joint IOA Southern and London Branch meeting in September 2022, where, using two notorious examples, he discussed speech and audio forensics – the application of various aspects of linguistics, phonetics and acoustics in legal investigation and proceedings.



The types of serious criminal cases where a forensic analysis of audio/speech recordings may be required include murder, terrorism, fraud, assault, firearms offences, kidnap and robbery. Recordings will come from a wide range of sources such as (commonly) phone calls, covert bugs, CCTV, mobile phones, dashcams, bodycams and police interviews.

One overarching complicating feature of these investigations is that recordings are frequently of poor quality, particularly in covert recordings, or very short in duration. Added to that is the fact that incidents generally occur in real environments (pubs, restaurants etc) with noisy backgrounds.

The most common type of analysis that forensic audio analyst will be involved in is 'speaker identification' or voice comparison, where the analyst compares the speech of a person of interest on an unknown recording with the speech features of a suspect in a known reference recording to arrive at a conclusion.

Speech and voices are variable and affected by many factors, including time of day, intoxication, emotional state and time passing between recordings etc so analysts focus on features that are most robust to these potential changes.


Speaker profiles

Analysts can be asked by the police what they can tell about a speaker from their voice recording and there are some features that can be assessed with varying degrees of accuracy, such as age, regional, ethnic or social background, whether there is a speech impediment (which may then allow the tracing of medical records). It is possible to tell if someone is disguising their voice (by putting on a fake accent or has used a digital device) and potentially, the location of the recording can be identified (indoors or outdoors, or anything that can be picked up in the background of the recording) and if the person on the recording is reading from a prepared text, this will also be apparent. It is not possible to establish height, weight or build of the speaker or their psychological state, sincerity or truthfulness.

One of the most well-known speaker profiling exercises was carried out between the 11th and 13th murders by Peter Sutcliffe (the Yorkshire Ripper). The police received a tape recording and letters purporting to be from the murderer, that they took very seriously. So seriously that they went on to investigate whose voice was on the tape. It was clearly a voice of someone who came from the north east of England (Newcastle area), so the tape was sent to an acoustic phonetician who analysed the recording in more detail and picked up some other features, such as h-dropping and vowel variants that indicated that the speaker was from Sunderland, not Newcastle. The police had

taken the taped message so seriously, thinking that it was from the Yorkshire Ripper, that it led to a major change in their investigation, where they now started looking for a suspect with a north east accent rather than a Yorkshire accent that had been identified by witnesses. The tape was from a hoaxer and this false lead allowed Peter Sutcliffe to commit two more murders. The hoaxer, John Humble, was at large until 2005 and was then convicted and jailed for eight years. Peter Sutcliffe had been stopped by police, but was let go because his Bradford accent didn't match the voice on the tape. Humble was eventually caught as part of a cold case review, after DNA analysis of the envelope and stamp that he used to post his letter, matched an existing profile on the police database.

Voice line-ups

Witnesses can be asked to try to identify a specific voice they heard during a crime if they were to hear the same voice again. So they wouldn't have seen the suspect, just heard them. In this instance, the phonetician will construct a voice line-up (similar principal to a visual line-up). However, it is very difficult to construct what could be considered a fair test and also factoring in human memory of how a voice had sounded. Careful consideration has to be given to how similar the 'foils' should sound to the suspect. Because of its complexity, this is an area of ongoing research. See more about current research here www.phonetics.mml.cam.ac.uk/ivip/overview 

Dr. Philip Harrison is a lecturer in the Department of Language and Linguistic Science at the University of York, where he teaches, supervises, and conducts research in forensic speech science. He worked as a forensic scientist for over 20 years at J P French Associates, an independent forensic speech and acoustics laboratory in York, UK.

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BRANCH NEWS

Southern Branch

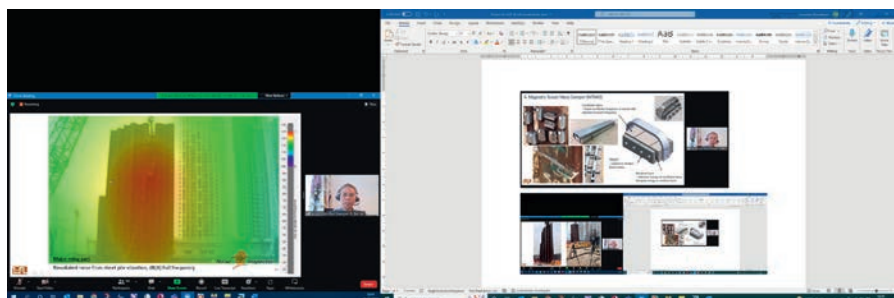
Wilson Ho's talk on construction noise control

By Sebastian Woodhams, Sustainable Acoustics

On Monday 3 October, around 100 IOA Southern Branch members had the pleasure of welcoming Wilson Ho of Wilson Ho & Associates Limited (Hong Kong), who presented a range of noise control solutions developed in Hong Kong, which he hopes will be beneficial to the UK construction market.

These included a lightweight noise barrier, which can extend to five metres or above and can be deployed within 15 minutes, sealed temporary enclosures which can be deployed within five minutes, and a magnetic tuned mass damper (MTMD) for sheet piling. Wilson discussed each product in detail and presented test data from real construction sites across Hong Kong for each.

The lightweight enclosures and noise barrier may prove useful for the UK construction market due to their ease of installation; they can be installed by hand by several site operatives without



the need for any heavy machinery. For example, the noise barrier is constructed from ground level and then held together with magnets to prevent any noise leakage between panels. Performances of STC 18 dB or greater can be achieved with these products.

The magnetic tuned mass dampers are fixed to sheet piles and reduce noise levels from piling activities by approximately 7 dB(A). Six dampers are fixed to the sheet piles surrounding the pile to be driven

Above: Part of Wilson Ho's presentation

(three on each side) and are installed by hand from ground level. Each damper consists of an aluminium pole attached to magnets to fix it securely to the pile, with oscillation masses which are tuned to match the vibration frequency of the pile.

Wilson is currently in the process of finding a manufacturing facility in the UK, and once this is secured these innovative products are likely to start appearing on construction sites around the country.

Central Branch

Acoustic design of mass timber buildings

By Matt Torjussen, IOA Central Branch Secretary

In September the IOA's Central Branch hosted Pliteq's James Bligh, who gave a presentation on the acoustic performance and embodied carbon in the acoustic design of mass timber buildings. James described how the embodied carbon of a mass timber building can be calculated using the surface area of the materials used in a given construction, how this compares to a concrete frame building, and how overspecification of acoustic treatments can jeopardise the carbon benefit.

We were also introduced to Pliteq's EchoOne platform, where anyone can access acoustics performance data for

their products in combination with a number of different building elements. This is designed to minimise the overspecification of acoustic treatments, reduce the excess materials used on a site and minimise the embodied carbon as a result.

The video for this and many of the previous Central Branch meetings can be found on the IOA's members' videos page here <https://www.ioa.org.uk/members/videos> (You'll need to be logged in for the link to work).

Keep an eye on the IOA website's events page for upcoming Central Branch meetings, as we're just finalising our November and December events.

We strongly encourage those local to Milton Keynes to attend meetings in person, as it is an excellent opportunity to meet others in the industry, discuss the presentation and, if you're not already an IOA member, you can meet potential sponsors for your application. To make sure you receive alerts about our events, sign up to the Central Branch in the 'My Details' section of your IOA account online.

The Central Branch is also still seeking a new Early Careers Officer to join the committee. For those who are interested, please contact our Chairperson, David Trew at (dtrew@bickerdikeallen.com).

SPECIALIST GROUPS

Underwater Acoustics Group

Presentation to Dr Peter Dobbins



The IOA Underwater Acoustics Group held their AGM on 21 September 2022, which was followed by a regular meeting. Many of the committee joined the meeting via Zoom but the Chair, Professor Gary Heald; Secretary, Andrew Holden and Linda Canty were in attendance at the IOA head office in Milton Keynes. Also in attendance was Dr Peter Dobbins who

had served on the committee for many years and, prior to the AGM, in 2021, had served as the Chair of the group for a number of years. The committee wanted to show their appreciation to Peter and so sourced a silver tankard engraved with the words:

*Presented to
Peter Dobbins
in appreciation of your service
from the
IOA Underwater Acoustics Group
Committee*

Peter worked tirelessly on the committee for many years, and organised a number of highly successful conferences. He is stepping down from the committee this year but the IOA and the Underwater Acoustics Group are group richer for his dedication and service. 🍷



Midland Branch

By Philip Hainsworth

The Midlands Branch was joined on Thursday 28 July by Jordi Femenia and George Taylor of Mason UK for a meeting on the topic of vibration isolation of heat pumps and HVAC.

Jordi and George focused on the useful guidance in CIBSE Guide B and provided examples of how the guidelines might be followed using off-the-shelf vibration isolation products, while accounting for the vibration characteristics of the source and the attached structure. They emphasised the importance of specifying treatment early so that short-circuiting could be more easily considered as part of the design and pointed out that many mechanical services engineers don't consider vibration isolation when designing a system, something that can lead to disruptive and costly mitigation works. 🍷



Above: The most recent Midlands Branch meeting focused on of vibration isolation of heat pumps and HVAC

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NEWS

IOA and John Connell Awards mentioned in Hansard

The IOA and the Noise Abatement Society's (NAS) John Connell Awards* have been mentioned in the House of Commons and reported by Hansard.

Below are the mentions made on 13 October 2022 in the House of Commons by its members documented in Hansard (the official report of all Parliamentary debates).

Dr Kieran Mullan (Crewe and Nantwich) (Con)

Many of us know that noise nuisance can be a real blight to our constituents, especially when it is one of those local hums that plague the people who hear it. May I put on the record my thanks to Alistair Somerville, President of the Institute of Acoustics, and council member Peter Rogers, who have been helping to investigate the 'Haslington hum' in my constituency?

Penny Mordaunt (The Leader of the House of Commons)

I thank my hon. Friend for placing that on record. This is incredibly important work. I understand that the John Connell awards* will be held next week in the Terrace Pavilion. Those awards support and recognise innovative ideas that have made a positive impact to reduce excessive noise, which is often a huge concern for our constituents.

The annual John Connell Awards are named after NAS's far-sighted founder John Connell OBE, who lobbied the Noise Abatement Act through Parliament in 1960 when noise became a statutory nuisance in the UK for the first time. Known as the 'Noise Oscars', these awards acknowledge the importance of the quality of sound in our lives, and champion vital advances in reducing the negative impact of unnecessary noise for the public benefit. Over 250 recipients from local authorities, industry, organisations and individuals have now been honoured for the significant impact they have made to improve the aural environment.

Stolen equipment

KP Monitoring Ltd (Part of the KP Acoustics Group) had some equipment stolen from a site in Barking (1am on 8 September 2022), near Custom House (DLR).

Crime reference number: SD-30677-22-0101-00.

They were two Zephyr air quality monitors (**serial numbers: #Z01117, #Z01080**) and one Svantek SV958 (**serial number #97992**).

If anyone has any information about the potential whereabouts or sees them listed for sale anywhere, please contact the main Environmental Monitoring Office to speak with Richard Booth or Emily Norman on **0208 222 8778** or email info@kpacoustics.com

Sound move

Simon Hancock has left Hann Tucker Associates (HTA) and co-founded a new sound and vibration consultancy, Quantum Acoustics.

Simon enjoyed more than 30 years at HTA, including more than 10 years as managing director. He is joined at the new venture by directors and fellow shareholders Andrew Fermer, John Ridpath and John Gibbs.

The four directors have more than 100 years combined experience as acoustic consultants, covering all aspects of acoustics. These include environmental noise and vibration surveys, planning noise and vibration impact assessments, architectural acoustics, building services acoustics, acoustic testing, computer modelling and simulation, construction/demolition monitoring, expert witness and legal assistance.

The team has worked extensively across all building sectors, including residential, office, education, justice, healthcare, leisure and retail, with responsibility for the planning, design and testing stages for many of the UK's most prestigious award-winning projects, as well as others around the world.

MD, Simon Hancock, said: "The directors of Quantum Acoustics are four of the UK's most experienced acoustic consultants, so we are well placed to offer our clients the very best independent acoustic consultancy. By forming our own fully independent consultancy practice, we have every incentive to ensure we deliver the best service. Therefore, Quantum Acoustics is extremely exciting, not just for us but also our prospective clients." ©



Above: (L-R) Andrew Fermer, Simon Hancock, John Gibbs and John Ridpath

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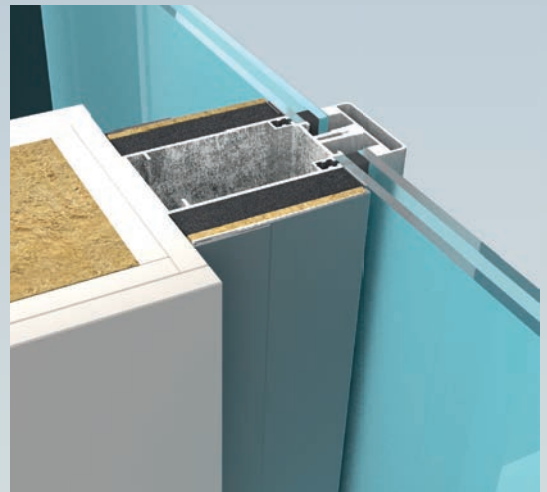
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Committee meetings 2022/23

DAY	DATE	TIME	MEETING
Thursday	17 November	10.30	Membership
Monday	21 November	10.30	CCWPNA Examiners
Monday	21 November	13.30	CCWPNA Committee
Tuesday	22 November	10.30	ASBA Examiners (Edinburgh)
Tuesday	22 November	13.30	ASBA Committee (Edinburgh)
Wednesday	23 November	10.30	Executive
Thursday	24 November	13.30	CCENM Examiners
Thursday	24 November	13.30	CCENM Committee
Wednesday	7 December	10.30	Council
Thursday	26 January	10.30	Membership
Thursday	2 February	11.00	Publications
Thursday	9 February	10.30	Meetings
Thursday	16 February	10.30	Diploma Tutors & Examiners
Thursday	16 February	13.30	Education
Tuesday	22 February	10.30	Engineering
Wednesday	23 February	10.30	Engineering

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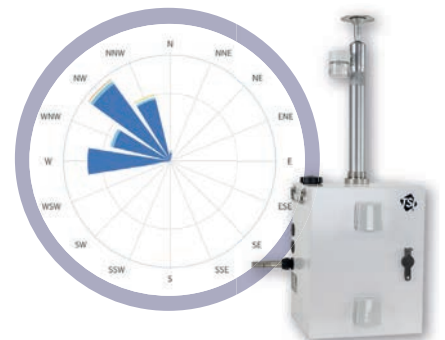


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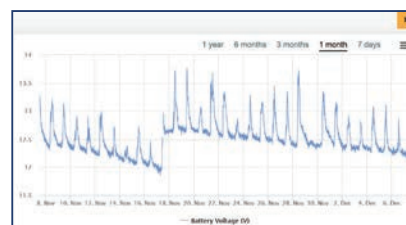


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