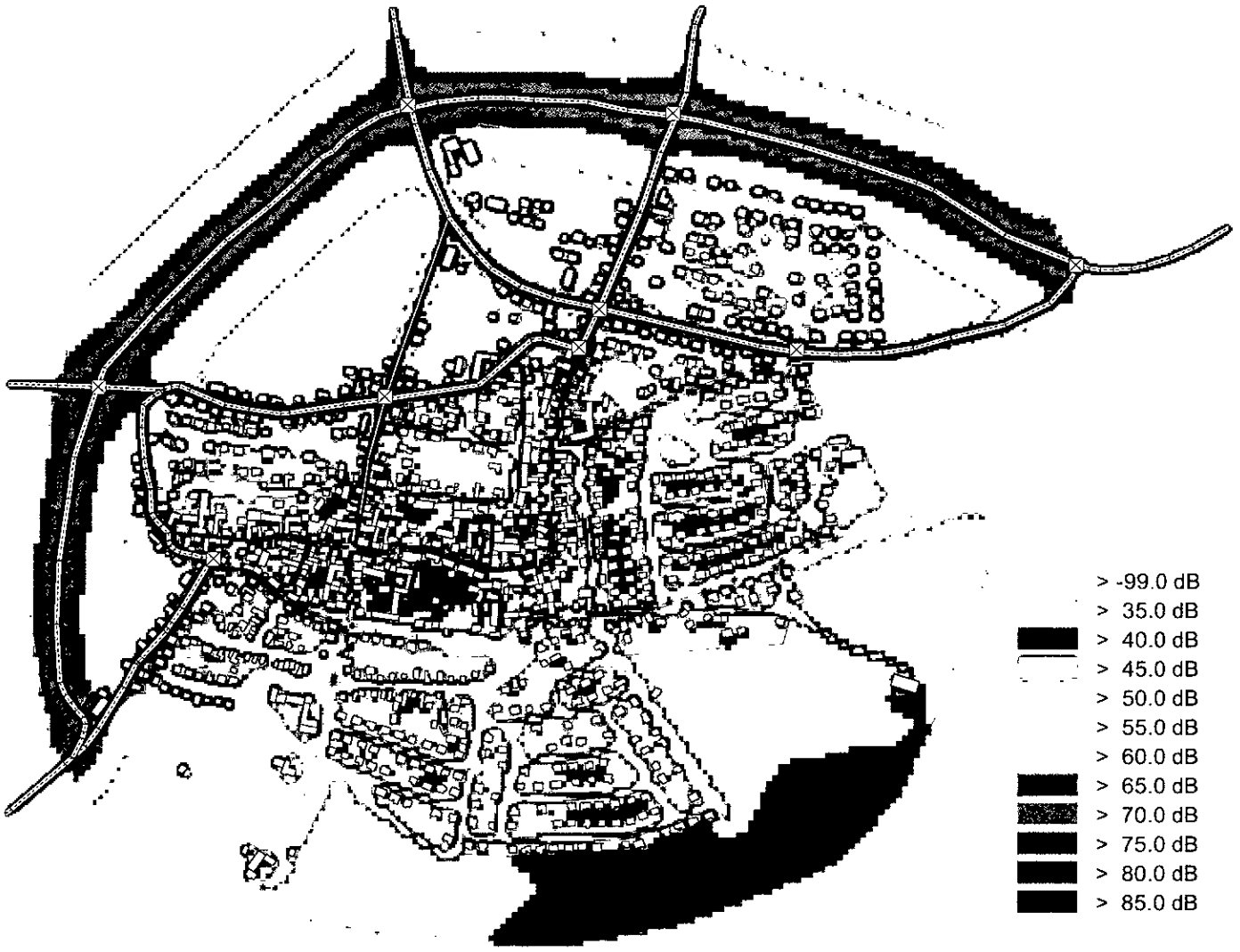
Acoustics BULLETIN

VOL 26 No 2 MAR/APR 2001



Calculating and Assessing Road Traffic Noise

Proposals for Amending Part E of the Building Regulations 2000
Code of Practice: Control of Noise from Pubs and Clubs
Flat Panel Speaker Technology
When Planning Conditions Don't Work

Institute of Acoustics

Acoustics BULLETIN

Vol. 26 No. 2 Mar/Apr 2001

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Contents

Institute of **Acoustics**

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

Fellow Members

Spring is here! And with it the start of our conference season, which kicks off with the Institute's Stratford Spring Conference which this year has been organised by the Speech and Hearing Group. The Group is using the meeting to promote its activities, and for the first time in several years the conference theme concentrates on developments and innovation in speech technology and spoken language engineering. A new format includes invited plenary papers from distinguished figures in the field, and the Institute is taking advantage of the occasion to award an Honorary Fellowship to Professor Adrian Fourcin of University College London. Adrian was largely responsible for bringing many of the Speech Group's activities within the formal remit of the Institute around twenty years ago.

Southampton University's Oceanography Centre hosts the Acoustical Oceanography conference from 9 to 12 April, another impressive programme destined to enhance the Institute's activities in this important area of research, consultancy and commercial activity. It's not my field of work, but even I can spot that a great deal of thought has gone into putting together such a formidable programme.

It is meetings such as these which contribute toward enhancing the Institute's international reputation as a global leader in Acoustics. Considerable credit goes to the organisers of these gatherings and also, of course, to the Meetings Committee whose role in showcasing members' activities is becoming increasingly important. It goes without saying, of course, that without quality speakers our conferences would not enjoy their current reputation. It is a credit to the profession that they match the world's best.

Sincerely

Mark Tatham

Mark Tatham

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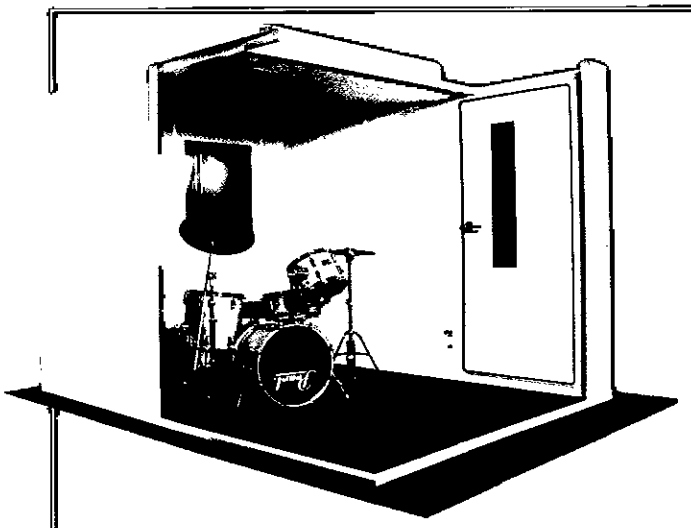

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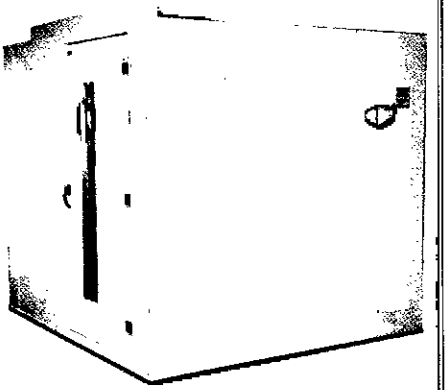

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Library acquisition:

Dictionary of Acoustics

A copy of **Dictionary of Acoustics** by *Prof C L Morfey FIOA* has been acquired for the Institute library. The science and technology of acoustics embraces an unusually wide range of disciplines, from aircraft noise reduction to ultrasonics in medicine and from psychoacoustics to signal processing.

The student of acoustics has to become familiar with a corresponding range of specialist terms in order to communicate with others and to understand the literature. Here, in one dictionary for the first time, are listed accurate and helpful definitions to provide a point of entry into the world of acoustics.

Definitions of nearly 3000 terms, ranging from the elementary to the highly specialised, cover most of the essential concepts the practising acoustician needs to understand, outside the subfields of music and speech communication.

The author has drawn on experience gained during a long career, spent mostly at Southampton University's multidisciplinary Institute of Sound and Vibration Research, supplemented by the expertise and perspective of a team of subject specialists.

Dictionary of Acoustics is, according to the publishers:

- ★ broad-ranging and comprehensive, covering all areas of fundamental acoustics (except terms specific to music and speech);
- ★ multi-level in its appeal: a reference source than can be used by undergraduates as well as PhD-level researchers, practitioners and consultants;
- ★ informative, with extended definitions of important concepts and a bibliography pointing to sources for further study;
- ★ easy to use: all entries are arranged alphabetically and are thoroughly cross-referenced;
- ★ supplemented with mathematical foundations and equations to add depth to definitions; and
- ★ written in consultation with 15 advisers on special topics and reviewed by acousticians of international standing.

Further noteworthy acquisitions for the Institute library will be announced in *Acoustics Bulletin* from time to time. The library resources include a full set of *Proceedings of the Institute of Acoustics,* specialist textbooks, and periodicals on several subjects related to acoustics. These are available to all members wishing to drop in to Headquarters in St Albans, whether just to browse, or conduct more formal research.

MEETING REPORT

Power to the people: the measurement of sound power

This meeting, the latest organised by the **Measurement and Instrumentation Group,** took place at the National Physical Laboratory in Teddington. There were 27 delegates, which promised an excellent array of presenters involved with different aspects of the measurement of sound power.

One of the driving requirements for knowledge of sound power measurement techniques is the new EU Directive relating to noise emission of equipment for use outdoors. **Karen Taylor** (Department of Trade and Industry) presented a paper by her colleague **Fran Buckle** describing the Directive's scope (see *Acoustics Bulletin, Jan/Feb 2001).*

This covers 57 types of equipment that must be marked with noise levels and may be subject to noise limits, and introduces the regime for Conformity Assessment, whether by self-certification or examination by a Notified Body.

The latter theme was taken up by **Martin Shipton** (UKAS). UKAS will assist in the appointment of conformity assessment bodies through their ongoing assessment against requirements developed by the DTI. Martin described in detail the processes by which UKAS will recommend appointments of Notified Bodies.

The Directive on outdoor equipment relies on standardised methods for determining sound power levels - as do many other requirements for noise emission measurement. **Roger Higginson** (Higginson Acoustics Ltd) described existing international standards for determining sound power by measurement of sound pressure, and the work within ISO for their revision and simplification.

Work is in progress to replace the eight standards in the existing ISO3740 series with four new standards. These will include in-situ methods, and methods relating the measurement effort to reproducibility and level of uncertainty.

Information on measurement reproducibility is necessary to meet the requirements of various Directives for sound power labelling of machinery, which include uncertainties arising from production and measurement procedures.

Richard Payne (National Physical Laboratory) described a programme of inter-laboratory measurements on a set of machines that has yielded proposed values of reproducibility for the new international standards. The proposed values vary with the number of measurement positions and the directivity index of the noise source.

After lunch, the programme moved away from the ramifications of Directives towards case studies of various measurement situations. **Jon Richards** (MW Kellogg Ltd) opened with a presentation on the measurement of the sound power of a large (4km^2) liquefied natural gas plant, carried out to satisfy local planning requirements.

Jon also described measurements of the sound power level of individual equipment items and various areas within the site. He explained the differences in results, concluding that the ISO8297 method is generally satisfactory.

Brian Olsen (ISVR, University of Southampton) followed with a paper co-authored by Chris Morfey describing the practicalities of a novel way of measuring the vibroacoustic power flow from a vibrational source connected to a water-filled pipe.

The method is applicable to thin or soft-walled pipes, and uses measurements at a series of points along the external surface of the pipe to determine the modal acceleration response. From these, a power flow from the vibrational source is deduced.

Oliviero Olivieri (Brüel and Kjær, Denmark), demonstrated the use of a PC-based real-time analyser and suitable application software in optimising the measurement and reporting process for those who routinely make determinations of sound power levels. The systems described are based on the relevant international standards, and the format of the reports can be customised for individual users.

The final presentation was made by **Keith Holland** (ISVR, University of Southampton) on research performed with P O A L Davies (ISVR) and D C van der Walt (Bosal Afrika) on the measurement of sound power flux in flow ducts such as engine intakes and exhausts.

Spectral analysis of signals acquired

continued on page 7

BRANCH REPORTS

Midlands

Activities 2000

Last year the Midlands Branch held four evening meetings and organised a half-day workshop, which was held at Derby University on *14 September.* Run by **W S Atkins**, the workshop's purpose was to enable members to acquire some 'hands-on' experience of noise mapping software.

During the first evening meeting, held on *23 March* at Birmingham University, **John Shelton** gave a presentation on noise measurement instrumentation, entitled *'Smoke and Mirrors'.*

Birmingham University was also the venue for our second evening meeting, held on *20 June.* Due to late unavailability of the advertised speaker, three members of the Midlands Branch Committee each gave a short presentation. These were:
Mike Fillery - *Motor racing noise;*
John Hinton - *Update on the proposed EU Environmental Noise Directive;* and
John Grant - *Noise from a proposed outdoor musical event.*

The third evening meeting took place at Coventry Town Hall on *27 September,* when **Nicole Porter** gave a presentation on *'The adverse effects of night-time noise'.*

The fourth and final evening meeting was held at Birmingham University on *14 November,* during which **David Trevor-Jones** gave a presentation on *'Ground vibration: BS6472 revisited and reviewed'.*

The **Branch AGM** was held before this meeting. Deborah Webb's resignation from the Midlands Branch Committee was accepted, and two additional Branch Members, Kevin Howell and Alan Whitfield, were welcomed onto the Committee. John Hinton continues as Chairman and Mike Fillery as Secretary for 2001.

Planned meetings 2001

Our first evening meeting was scheduled for *14 March* at Coventry, with speaker **Colin Grimwood** discussing: *'Proposals to amend Part E (resistance to the passage of sound) of the Building Regulations'.*
Evening meeting 2: *6 May 2001*
Venue: Derby. **Speaker:** Brian Hemsworth. **Subject:** *'European railway noise research'.*
Evening meeting 3: *Sept 2001*
Date, venue and speaker to be confirmed. **Subject:** *'Vibration'.*
Evening meeting 4: *Nov 2001*
Date, venue and speaker to be confirmed. **Subject:** *'Noise measurement equipment used outdoors'.*
Afternoon meeting: *Sept 2001*
Date and speaker to be confirmed
Venue: Birmingham International Airport. **Subject:** *'Aircraft noise and aircraft noise monitoring systems'.*

John Hinton *(Chairman IOA Midlands Branch)*

North West

Fans and CHP Plant

In January, **John Batty** (Clarke Energy) presented a practical view of the control of noise from fans and CHP plants to a well-attended meeting at BDP's Manchester office.

Having started with a discussion of different types of fans and impellers, and given a brief overview of the noise generation mechanisms, John went on to discuss simple predictive methods for fan noise.

Focusing on a particular case history, the main part of his presentation examined in detail the acoustic design of a gas-engined power plant, where five engine cells with levels of up to 110dB(A) were attenuated to meet specifications of 50dB(A) at 40m and 35dB(A) at 160m.

He examined each major source, worked through the noise level predictions, and discussed the practicalities of attenuation.

With the occasional useful aside, John touched on the importance of maintaining a cost effective solution, balanced against the risk of exceeding the specification and potentially expensive remedial works.

Nick Antonio

Alistair Cowley - Chartered Engineer

Alistair Cowley BSc CEng FIOA FASA, is to be congratulated on achieving Chartered Engineer status.

Alistair graduated with a Bachelor's degree in Applied Mathematics from Manchester University in 1980, working as a student scientist at the Royal Aircraft Establishment. He then joined the Admiralty Underwater Weapons Establishment at Portland, Dorset.

His early research was concerned with acoustic wave propagation in visco-elastic media and the theory of sonar flank arrays. Between 1985 and 1993 he worked on full acoustic wave equation solutions and the physics of acoustic systems operating in the wake of surface ships.

In 1993 he returned to the sonar department of the Defence Research Agency (now DERA) to lead the programmes on submarine and surface ship hull-mounted sonar and in 1997 became a Fellow of the Institute of Acoustics.

In 1999 he was awarded a fellowship of the Acoustical Society of America for contributions to self-noise reduction, bubble acoustics and ambient noise discrimination.

Corrections

Two errors appeared in Volume 26, Number 1 (the *January/February 2001* issue) in the article *Sonar performance in coastal environments* by **Simon Richards** and **Timothy Leighton.** In the *'Example results'* paragraph on page 16, the particle radius is quoted as **2mm (millimetres)**, and this should be **2μm (micrometres).**

The same error is repeated on *line 23* of the same paragraph, where the range of bubble radii is quoted as **10-200 mm (millimetres)** instead of **10-200 μm (micrometres)**. We apologise to the authors for the grossly distended bubbles.

Our sincere apologies also go to **University of Salford** and **CoNEL** for the blanks against them in the table of *Diploma Project results* on *page 40* of the *January/February issue.*

To put the record straight, Salford's candidates achieved two merits, four passes, and four fails; CoNEL's achieved three merits, ten passes and four fails.

Contrary to the statement in the report on the **Diploma** on *page 41,* the introduction of coursework for the specialist modules is delayed. The format of the examination and coursework for the current presentation of the Diploma will be unchanged from last year.

Editor's Notes

Welcome to the second new-look issue of *Acoustics Bulletin.* It falls to me as the 'new boy' to mention that we have reached the 25th anniversary of the Bulletin: volume 1, number 1 appeared in April 1976.

I see that the Control of Pollution Act 1974, the Control of Noise (Appeals) Regulations and the Control of Noise (Code of Practice for Construction Sites) Order had all just arrived in 1976. The Government was about to establish an Institute for Hearing Research, and in Parliament the Secretary of State for Trade was answering questions on aircraft noise. (Twenty-five years on, his successor was answering questions on - aircraft noise!).

Looking forwards, it is the intention to make *Acoustics Bulletin* informative, readable, and appealing to all the membership. Environmental noise, building acoustics, and industrial noise groups account for about three-quarters of us, but I hope to shed light too on less well known topics, as well as presenting consultancy successes (failures, anyone?) and technical articles of broad interest. I know that many found the *January/February* issue something of a surprise, and all feedback is helpful.

As always, we are dependent on members' efforts for the bulk of our published material, and I thank all recent contributors. Reports of meetings are always welcome, as are offers of technical contributions. Written material can be faxed to 0161 476 0929, sent via Head Office, or e-mailed direct to me at ian@acia-acoustics.co.uk: the deadline for the May/June issue is 11 April 2001.

Ian Bennett

Ian Bennett BSc CEng MIOA

Editor

continued from page 5

from pairs of flush-mounted transducers was used to estimate the net sound power flux. Refinements to the method he described will help to characterise individual silencing elements in future tests of IC engine noise.

The day concluded with an open discussion session led by meeting organiser Peter Hanes, during which delegates could quiz the authors in detail. Debate was lively, and ranged across technical and regulatory issues, leaving no doubts about the importance of the topic to the delegates, or the expertise of the presenters.

Peter Hanes MIOA

PROPOSALS FOR AMENDING PART E OF THE BUILDING REGULATIONS 2000

Resistance to the Passage of Sound

Consultation Package

On 19 January, the Department for Environment Transport and Regions, DETR published far-reaching proposals for the amendment of Part E of the Building Regulations. The proposals include:

❑ Replacing current requirements E1, E2 and E3 with a new E1 that sets requirements on the sound insulation between dwellings, and between dwellings and other buildings. The scope has been broadened to include *rooms for residential purposes* - for example, hostels, hotels, residential care homes and student accommodation.
❑ Introducing a new E2 that sets requirements on sound insulation between the rooms within a dwelling. This specifically covers the sound insulation of WCs and bedrooms.
❑ Introducing a new E3 that sets requirements on the sound insulation of dwellings against external noise.
❑ Introducing a new E4 that sets requirements on the control of reverberation in the common parts of flats etc.
❑ Introducing a new E5 that sets requirements for the acoustic conditions in schools. (From 1 April 2001, all schools will be subject to the requirements of Building Regulations).
❑ Removing Part E from the list of Parts given in Building Regulation 8, which currently limits Part E to measures securing reasonable standards of health and safety. It will now also be concerned with welfare.
❑ Amending the material change of use Regulations to extend Part E to cover hotels, boarding houses and rooms for residential purposes - so the Regulations would apply more widely where a building is being converted to residential use.
❑ Introducing a new Building Regulation and a new Approved Inspector Regulation which give building control bodies the powers to ask builders to carry out pre-completion testing of sound insulation on specified dwellings.

The effects of noise

The Chartered Institute of Environmental Health reports that the number of complaints about domestic noise has now reached over 5,000 per million population and that the total number of such complaints trebled in the ten years between 1986 and 1996. The *1996 English House Condition Survey* indicates that nearly one quarter of households were bothered by noise either from traffic, industry or neighbours. A BRE study indicates that about 25% of occupants living in dwellings that attained the current standards for sound insulation rated the insulation as 'poor' or 'very poor'. It is estimated that in new dwellings, as many as 40% of separating floors and up to 25% of separating walls may fail to meet current standards.

The adverse effects of noise include loss of sleep, stress and high blood pressure and may result in a handful of deaths each year, resulting from suicide or assaults. The overall aim of the proposed amendments to Part E is to secure reasonable standards of health, safety and welfare, without imposing disproportionate bureaucracy and costs on builders, materials producers, building owners or building control bodies. The key objectives are to improve standards of sound insulation and to significantly improve compliance with the Regulations. The anticipated annual national cost of the proposals is £74.5m.

New performance indicators

For separating walls and separating floors, the proposed sound insulation requirements are based on performance indicators from BS EN ISO 717-1 and 717-2: 1997. Airborne sound insulation is rated in terms of $D_{nT,w} + C_{tr}$ (replacing $D_{nT,w}$) and impact sound insulation is rated in terms of $L'_{nT,w} + C_I$ (replacing $L_{nT,w}$). These indicators place greater emphasis on the low frequency performance of separating walls and separating floors. For heavier constructions, such as concrete, the $D_{nT,w} + C_{tr}$ value is about 5dB lower than the corresponding $D_{nT,w}$ value. For lightweight construction, the differential increases to between 8 and 12 dB.

The IoA Workshop

To launch the consultation process, which ends on 20 April 2001, the Institute held a half-day workshop on 31 January. It was organised by the Building Acoustics Group and hosted by the Building Research Establishment at Garston. It was attended by 137 delegates.

The Chairman of the *Building Acoustics Group*, **Bob Craik**, introduced the speakers and chaired the discussion session which followed. Formal presentations were made by **Les Fothergill** of DETR, and by BRE staff **Colin Grimwood, Matthew Ling** and **Carl Hopkin.** These included a review of the consultation process and the new requirements, the results of a regulatory impact assessment (RIA), the requirements for pre-completion testing and the guidance to be given in relation to separating constructions and the other new requirements. *(See overleaf for a summary of the contents of the proposed new Approved Document).*

The formal presentations were followed by short contributions from delegates. **Dani Fiumicelli** (London Borough of Islington) was concerned that the removal of Part E from Regulation 8 would prevent environmental health officers from citing the Approved Document as representing a reasonable minimum standard to secure health and safety in noise nuisance cases. He also thought more specific guidance was needed where a dwelling shares a separating wall or floor with a potentially noisy commercial use, such as a restaurant or bar.

Nick Antonio (Arup Acoustics) questioned where the responsibilities would lie if, following occupation, a construction was found not to meet the requirements. **Gavin Irvine** (Fleming and Barron) considered that the proposed new numerical standards would not give rise to the claimed 3dB improvement and demonstrated how they could actually result in poorer standards. **Sean Smith** (Napier University) also considered the benchmark figure too low. **Bernadette McKell** (Stanger Science and Environment) stated that impact insulation standards had diminished when the BS5821/ISO717 weighting system was originally introduced and considered that the new proposals did not redress this. **Martin Woodward** (Woodward Acoustics) was pleased to see the guidelines in the draft AD dealing with beam and block floors and timber joist floors, which he had found to be problematic. **Nigel Cogger** (English Cogger Partnership) considered that the Regulations depend too much on meeting a minimum standard and contrasted this with practice in Germany and the Baltic States, where different grades of sound insulation were available: this encouraged developers to use sound insulation as a selling point.

A lively discussion session ensued and this was expertly chaired by **Bob Craik,** who sought a show of hands on a number of the major issues arising. These straw polls indicated that the majority of delegates were in favour of expanding the scope of the Regulations to include internal divisions, the building envelope, reverberation in common areas and to cover rooms for residential purposes and schools. There was also support for the principle of pre-completion testing and the proposed change to the rating system, but the majority considered that the numerical values proposed did not represent an improvement on current numerical standards, despite BRE assurances to the contrary. This gave rise to concern amongst many delegates that some of the poorer performing proprietary systems would continue to be used on the basis that they can just meet the numerical standards.

The question of whether or not those carrying out pre-completion testing should be UKAS-accredited proved controversial, with delegates expressing views both for and against. The option of allowing certification or accreditation by third parties, other than UKAS, was favoured, however. The suitability of building control bodies to implement the requirements for pre-completion testing was debated. **Ray Shack** (Acoustic Design Services) considered that there would be difficulties in deciding where and when testing was to be carried out, given the many different configurations which may exist in a residential block.

'The question of whether or not those carrying out pre-completion testing should be UKAS-accredited proved controversial'

With regard to the external envelope of dwellings, **Ken Dibble** (Ken Dibble Acoustics) pointed to a discrepancy between the proposals and PPG24 *Planning and Noise.* Guidance in the latter is based on achieving a level of 35dB $L_{Aeq,8h}$ in bedrooms at night, whilst the new proposals are based on target level of 30dB. This is also in conflict with BS8233 which cites 35dB as a reasonable standard for bedrooms. **Matthew Fisher** (Hoare Lee Acoustics) considered it inappropriate to require mechanical ventilators in bedrooms at exposure levels corresponding to PPG24 Noise Exposure Category B.

Bob Craik drew the discussion to a close, thanking those responsible for its organisation, notably BRE (Colin Grimwood), members of the Building Acoustics Group (Nick Antonio and Stephen Chiles) and staff in the Institute Office. He also thanked all speakers and delegates for their contributions. The Building Acoustics Group will be formulating a formal response to the DETR consultation package. If you wish to make a contribution, your comments should be sent to the Chairman of the Building Acoustics Group, care of the Institute Office. The Consultation Package can be downloaded at *www.construction.detr.gov.uk/consult/amenparte/index.htm.*

PROPOSALS IN THE NEW APPROVED DOCUMENT ARE SUMMARISED OVERLEAF

NEW APPROVED DOCUMENT

Summary of proposals

continued from page 9

Section 0: Performance

The normal way of satisfying the requirements for separating walls, separating floors and stairs will be to meet the following numerical performance standards:

Airborne sound insulation (field test), $D_{nT,w}+C_{tr}$ (minimum values)

Walls, floors and stairs in purpose built dwellings Floors and stairs in purpose built rooms for residential purposes	45
Walls, floors and stairs in dwellings formed by material change of use Walls in purpose built rooms for residential purposes Walls, floors and stairs in rooms for residential purposes formed by material change of use	43

Impact sound insulation (field test), $L'_{nT,w}+C_I$ (maximum values)

Floors and stairs in purpose built dwellings Floors and stairs in purpose built rooms for residential purposes	62
Floors and stairs in dwellings formed by material change of use Floors and stairs in rooms for residential purposes formed by material change of use	64

Section 1: Pre-completion testing

Testing should be carried out for:

- ❑ purpose built dwellings
- ❑ dwellings formed by material change of use
- ❑ purpose built rooms for residential purposes
- ❑ rooms for residential purposes formed by material change of use

Testing should not be carried out between living spaces and corridors.

The Building Control officer should select the properties to be tested following guidance given in the AD. In general, two pairs of rooms — one living room pair and one bedroom pair — should be tested against each of the relevant requirements. On large developments, at least one set of tests is proposed for every ten dwellings (assuming no tests are failed).

The above figures apply to individual test results, so a shortfall of any margin is deemed to be a failure. If an individual airborne or impact sound insulation test result is 1 or 2 dB from the required standard, remedial treatment may be required at the building control body's discretion. If any test result is 3dB or more from the required standard, treatment should be applied and a follow-up test carried out.

For listed buildings subject to a material change of use, best-practicable-means applies and a performance declaration is made and displayed in a conspicuous place in the building.

Section 2: Separating walls and associated flanking constructions for new buildings and

Section 3: Separating floors and associated flanking constructions for new buildings

Wall types 1-4 and floor types 1-3 are described, as in the *1991 Approved Document*, but the format and layout is extensively revised. Tabular guidance is given as to which flanking constructions can be used with which separating construction and for which guidance is given in the AD.

Specific guidance is given on the specification of wall ties in separating and external (flanking) walls, including a formula to calculate the dynamic stiffness requirement.

There are some minor modifications and development of the detailed specifications. Detail diagrams are more explicit and isometric diagrams are provided for junctions. There are do's and don'ts for each construction type.

Wall constructions remain much as before, but dry linings are not permitted on most masonry walls because they tend to reduce low frequency performance (owing to a mass-air resonance), where the new rating method is more sensitive.

For floor constructions, the beam and block base floor is no longer included in the guidance and there are enhanced ceiling requirements. For example, a plasterboard ceiling is now required under Floor Types 1 and 2, sometimes with a batten fixing, sometimes using resilient bars.

Floor type 3 (timber joist) has changed radically. Two sets of joists are now required: an upper set to support a timber deck with a floating platform floor and an interlaced lower set to support a plasterboard ceiling with mineral fibre in the cavity. To control flanking transmission associated with this type of floor, the inner leaf of a masonry cavity wall should be lined with an independent panel.

A resilient layer option for Floor Type 2 includes a specification of dynamic stiffness. The specification of proprietary floating floors is now included.

Section 4: Dwellings formed by material change of use

The ribbed floor option in the current AD has been removed. Otherwise, treatments given in Section 4 are similar to the conversion treatments in the present AD.

Section 5: Internal walls and floors for new building

Requirement E2 applies to partitions around WCs and partitions and floor constructions around bedrooms. The normal way of satisfying the requirement will be to use a wall or floor construction with a minimum laboratory sound insulation value of 40dB R_w. Some examples of suitable constructions are given in the draft AD.

Section 6: Rooms for residential purposes

Versions of new-build Wall Type 1 and Wall Type 3 are offered for wall constructions in rooms for residential purposes. Floor Type 1 is offered as a suitable floor construction.

Between rooms and corridors, it is acknowledged that the resulting sound insulation will be dictated by the door and the recommendation is made that this should weigh 25kg/m^2 and be well sealed.

Section 7: Building envelope insulation

The normal way of satisfying requirement E3 will be to adopt specified constructional measures, based on the external noise exposure. Measures should take into account the noise exposure in the foreseeable future. The local Development Plan should also be taken into account.

Example envelope constructions are given for five levels of external exposure:

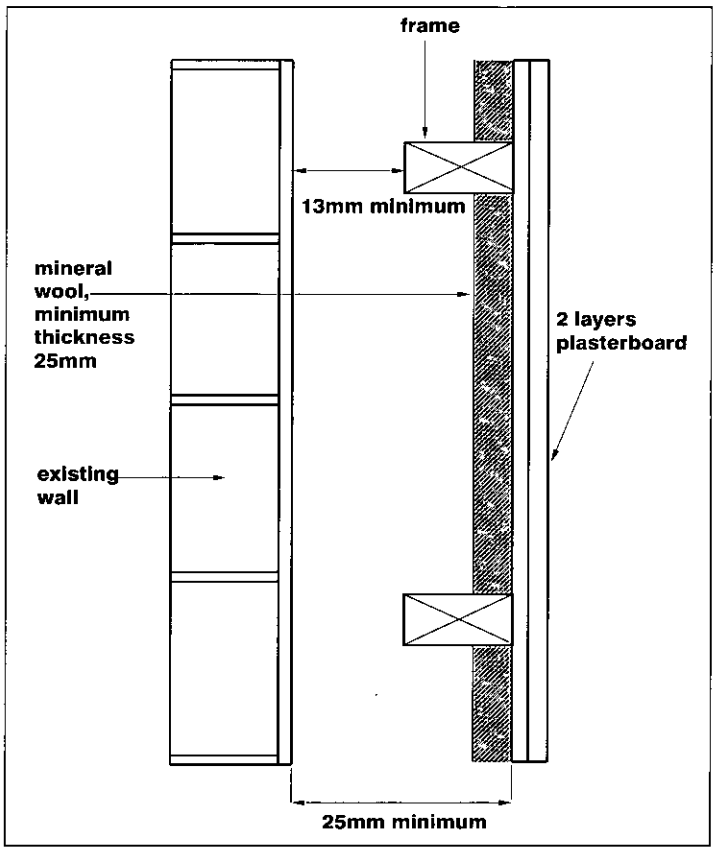
❑ Not exceeding 55dB $L_{Aeq,16h}$ (0700 – 2300 hours) or 45dB $L_{Aeq,8h}$ (2300 – 0700 hours) :No specific requirements
❑ Not exceeding 60dB $L_{Aeq,16h}$ or 50dB $L_{Aeq,8h}$: Constructions given include virtually any practical wall, window and roof construction with well sealed windows (when closed) and trickle ventilators
❑ Not exceeding 65dB $L_{Aeq,16h}$ or 60dB $L_{Aeq,8h}$: Virtually all practical wall constructions are permitted. Double glazing (10/12/6 mm) well sealed when closed. Roof/ceiling: 9kg/m^2 plasterboard with 100mm sound absorbing layer. Mechanical ventilator in bedrooms, acoustic trickle vent in other living rooms.
❑ Not exceeding 75dB $L_{Aeq,16h}$ or 65dB $L_{Aeq,8h}$: Solid brickwork, brick/block cavity and brick clad timber frame walls permitted. Double window (6/100/4 mm) limited to no more than 2.5m^2. Roof/ceiling: 20kg/m^2 plasterboard with 100mm sound absorbing layer and timber boarding on top of ceiling joists. Mechanical ventilators throughout.
❑ Exceeding 75dB $L_{Aeq,16h}$ or 65dB $L_{Aeq,8h}$: a specialist should be consulted.

Annex C provides supplementary guidance on building envelope insulation. The target internal noise limits are stated as 40dB $L_{Aeq,16h}$ in all rooms during the daytime and 30dB $L_{Aeq,8h}$ in all bedrooms at night. The night time target of 30dB(A) is in line with current WHO Guidelines to obtain "a good night's sleep", but exceeds the target of 35dB(A) given in PPG24, which was based on earlier WHO Guidelines.

Annex C also states that, in order to help prevent sleep disturbance, individual noise events (measured with F time weighting) should not normally exceed 45dB L_{Amax} in bedrooms during the night-time. This is consistent both with PPG24 and current WHO Guidelines.

The guidance is intended to ensure that the target levels are not exceeded when windows are closed and background ventilation is provided. When windows are opened for rapid ventilation, an increase in internal noise levels is inevitable, and it is not reasonable to expect the target levels to be achieved.

Annex C gives guidance on the identification of low noise sites, where a noise survey is not required. A calculation method is set out, which is based on BS EN 12354-3:2000 and involves octave band calculations over the frequency range 125 to 2000 Hz.



Wall treatment for existing walls

BS EN ISO 717 spectra are used to characterise the source, and sound insulation data is given for typical constructions.

Section 8: Reverberation in the common internal parts of buildings containing dwellings and rooms for residential purposes

Two methods are offered to satisfy requirement E4. Whichever method is used, evidence should be provided in the form of a report.

❑ **Method A:** Cover a specified area with an absorber of an approved class that has been rated according to BS EN ISO 11654:1997. An area which is equivalent to the ceiling area should be covered in a Class C absorber or better. This can conveniently be achieved by installing an acoustic tile ceiling, but other surfaces may be treated instead.

❑ **Method B:** Determine the minimum amount of absorptive material using a calculation procedure in octave bands (250 to 4000 Hz). A table of absorption coefficients for common materials is given in the AD. Proposed absorbers should have been tested in accordance with BS EN 20354: 1003. A worked example is given.

Section 9: Acoustic conditions in schools

The normal way of satisfying requirement E5 will be to ensure that the values for sound insulation, reverberation time, and internal noise which are described in Section A of Building Bulletin 87 *Guidelines for Environmental Design in Schools* are met.

Further guidance will be given in Building Bulletin 93 *The Acoustic Design of Schools*, which is to be published during 2001.

Calculating and assessing road traffic noise

W Probst and B Huber

Abstract: Road traffic is one of the most important sources of noise in urban areas. Its emission may be reduced by improvements of engines, tyres and road surfaces, but this will not eliminate the problem completely in the foreseeable future. It is therefore important to evaluate this noise thoroughly when alternative strategies are discussed in city planning projects. An important step in the evaluation process is the calculation of noise maps for urban areas. The procedure is demonstrated without algorithms and formulas, because these depend on the national standards and other regulations. The calculations take into account topographic features and screening and reflection by objects like buildings and other barriers near source or receiver. With the noise maps (or the corresponding data files) the alternatives can easily be ranked in order of noise impact. The calculation is demonstrated with a simple example. All the figures, calculations and maps were produced using Datakustik's Cadna/A software.

Many people suffer from noise emitted by car traffic in cities and other urban areas. The main problem is the noise emission of the engines at low speeds and the noise from tyre-road contact at higher speeds. It is unlikely that this problem will be solved completely in the near future.

At the planning stage, techniques to minimise the noise impact on population are more important than noise control at source. The starting point for such an evaluation is the time dependent sound pressure level when a car is passing. To evaluate the mean sound pressure levels for day and night-time, it is sufficient to use the mean dependency of sound emission from the traffic parameters for passenger cars and lorries, without regard for individual types. The sound propagation is influenced by screening, and by reflections from buildings and other objects. The calculation of mean sound pressure levels on a grid and appropriate interpolation techniques lead to a noise map. If such a noise map exists for all the alternative strategies considered, they can easily be ranked with respect to noise levels and head of population affected.

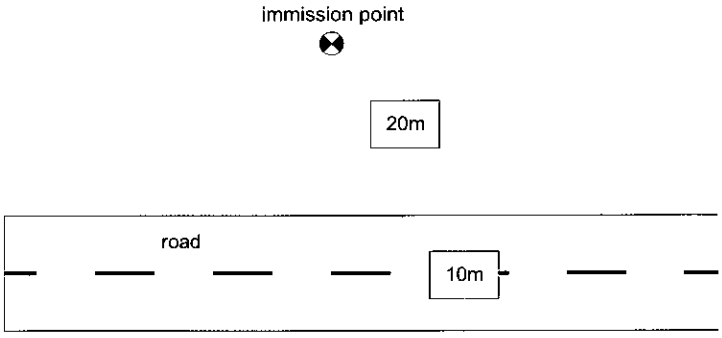


Figure 1: A car is passing the immission point with speeds of 30, 50, 80, 100 and 120 km/h

Calculation and presentation of traffic noise

The noise emissions of passenger cars, goods vehicles and other vehicles depend on their speed. It is well known that the sound pressure level near a road increases with the maximum speed allowed. The dependency for the simple road layout in **Figure 1** is shown in **Figure 2**. A single car is passing on a straight road, while the sound pressure level is measured at a point 20m from the centreline of the road. If the road is 10m wide the minimum distance between immission point and car is 25m.

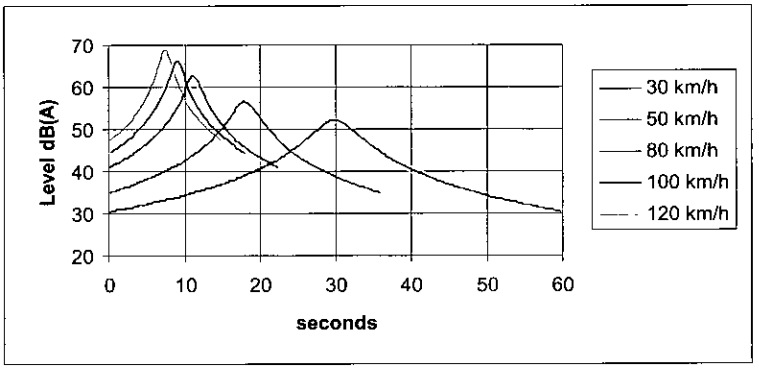


Figure 2: Time history of sound pressure level at the immission point, when a passenger car is passing

The curves in **Figure 2** are calculated using the German model for the calculation of traffic noise. They are derived from measurements of the mean sound pressure level near roads with different maximum speeds and thus describe a 'mean passenger car' on a road with the given maximum speed limit.

The maximum sound pressure level increases approximately 10dB if the speed of the car is doubled, but the time taken to pass the immission point is reduced. Therefore the mean sound

pressure level of such an event will show a smaller increase than the maximum sound pressure level.

Each track of the road is a line with the cars as moving point sources on it. Most of the regulations concerning traffic noise are related to the time-averaged mean sound pressure levels. The tracks of a road can be regarded as line sources with continuous distribution of sound power. This approximation is also useful for the calculation of the instantaneous sound pressure level if large numbers of cars are to be taken into account.

For the calculation of noise immission it is sufficient to consider the two outer tracks, and to replace the existing traffic flow with these two line sources, half of the traffic being on each.

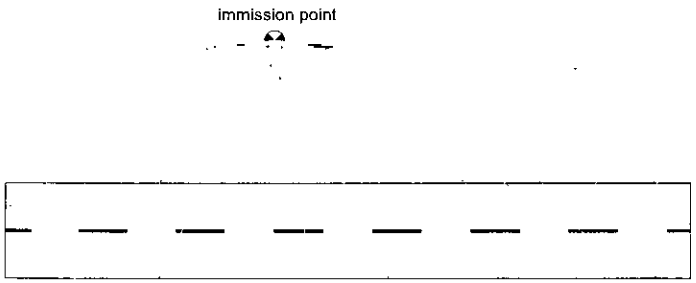


Figure 3: Subdivision of the outer tracks and rays from the midpoints of the elements to the immission point

When sound pressure levels are calculated, the line sources are subdivided into line elements, in such a way that no element is longer than half the distance from the midpoint of the element to the immission point. For this calculation each line element is replaced by a point source at its midpoint, but with its actual sound power. **Figure 3** shows this subdivision and all the rays from the element midpoints to the immission point, so that a calculation of the sound contribution from each may be made. The elements are smaller near the immission point and larger at greater distances.

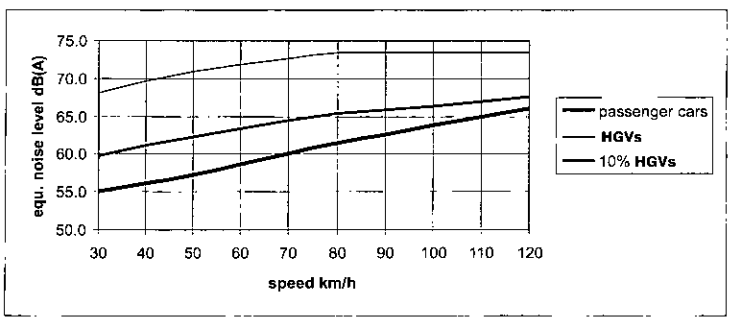


Figure 4: The mean sound pressure level at the immission point with 600 cars per hour and a given maximum speed (the driven speed for HGVs is 80 km/h for all maximum speeds exceeding 80 km/h)

The equivalent sound pressure level at the immission point is calculated by adding all the contributions of the different elements. This equivalent sound pressure level is the mean level for a given period, *eg* for daytime or night-time.

Figure 4 shows the calculated equivalent sound pressure levels for a traffic flow of 600 cars per hour for three cases in the situation shown in **Figure 1**. The curves are derived from the time-dependent sound pressure levels of **Figure 2** for passenger cars and of similar curves for heavy goods vehicles. The increase with speed is obviously smaller than that of the maximum level in **Figure 2**.

When the calculation is repeated for a grid of immission points, lines of equal equivalent sound pressure level can be derived by interpolation. **Figure 5** shows the noise distribution near the road for the same case.

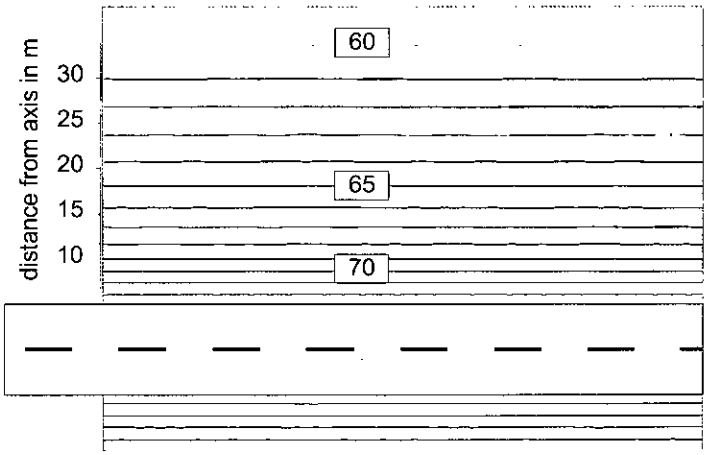


Figure 5: Lines of equal equivalent sound pressure level when 600 passenger cars per hour are passing at 80 km/h

Reduction of noise levels by screening objects

Regular patterns of noise contour lines like those shown in **Figure 5** are the consequence of free sound propagation without barriers, buildings or other obstacles. If such objects are present, screening and reflections have to be taken into account.

The reduction of the sound pressure level by a barrier is a function of the difference between the length of the path around or over the barrier, and the direct path between source and receiver. For a single object the contribution of the three shortest paths over the top and around the two sides are taken into account in order to calculate the sound pressure level behind the barrier.

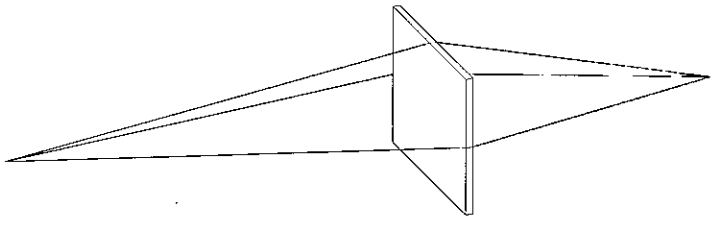


Figure 6: Three paths are determined when the energy contributions behind a screening object are calculated

If more objects than one are crossed by the straight line from the source to the receiver, the combined screening has to be taken into account. **Figures 7, 8** and **9** show the most commonly used calculation techniques in different countries.

continued on page 14

The Association of Noise Consultants

The Association of Noise Consultants (ANC) is a non-profit organisation formed to promote the reputation of professionals in the field of noise control engineering.

The primary purposes of the Association are to:

- *promote engineering solutions to noise problems*
- *improve and control the quality of service offered*
- *advance the reputation of the profession*

The ANC publishes guidance documents to ensure uniform technical competence is achieved. Membership is open to practices able to demonstrate to the satisfaction of the Association that:

- *the necessary professional and technical competence is available*
- *a satisfactory standard of continuity of service and staff is maintained*
- *there is no significant financial interest in acoustical products.*

In addition, members are required to carry a minimum level of professional indemnity insurance.

There are currently more than 50 member companies and practices, mainly in the UK, with 2 in Europe.

Any company interested in beco ming a member of the ANC should contact Gwen Rhein at the address below to receive a membership pack.

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Calculating and assessing road traffic noise

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Method 1 **(Figure 7)** shows a widely used principle of the screening calculation. An enveloping line like a ribbon is drawn over all objects from the source to the receiver. This roundabout way defines the additional path length and the reduction of sound pressure level. The method gives levels that continuously change with varying heights of barriers, and is therefore appropriate for calculating noise maps in cities and other areas with many objects.

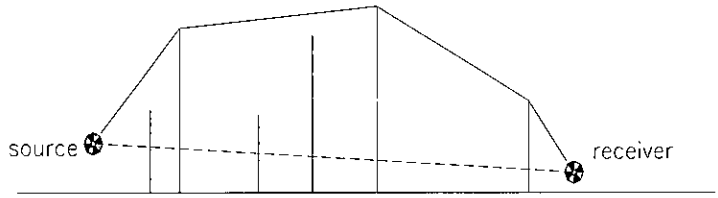

Figure 7: Method 1 for the calculation of the screened sound contribution with many barriers

Method 2 replaces all the screening objects between source and receiver with a barrier of a height defined as shown in **Figure 8.** Two straight lines, one pivoted at the source location, the other at the receiver, are rotated until each touches the top of one single screening object without crossing another. The point where the two lines meet determines the effective height of the single barrier.

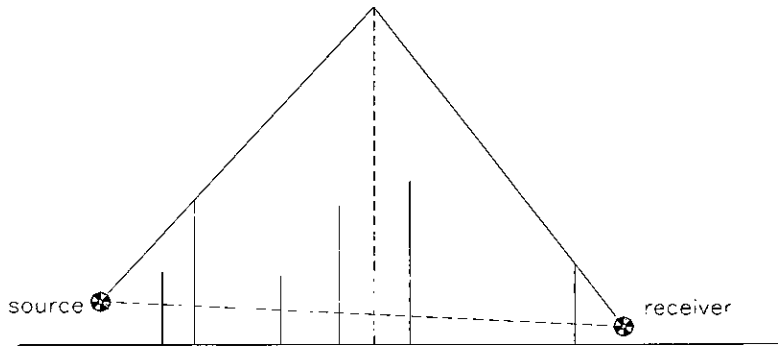

Figure 8: Method 2 for the calculation of the screened sound contribution with many screens

In method 3 **(Figure 9)** the effect of each single barrier is calculated in isolation, then the two most effective barriers are used to calculate the sound reduction.

Methods 2 and 3 can lead to jumps in the resulting lines of equal sound pressure level when the upper edges of the barriers are not horizontal, or if more objects come into play. This can also occur in method 3 when the paths around the sides of barriers also have to be taken into account. The 'two most effective barriers' might be different for paths over the top and around the sides. From experience, method 1 has proved sufficiently reliable in most cases where noise maps have been calculated.

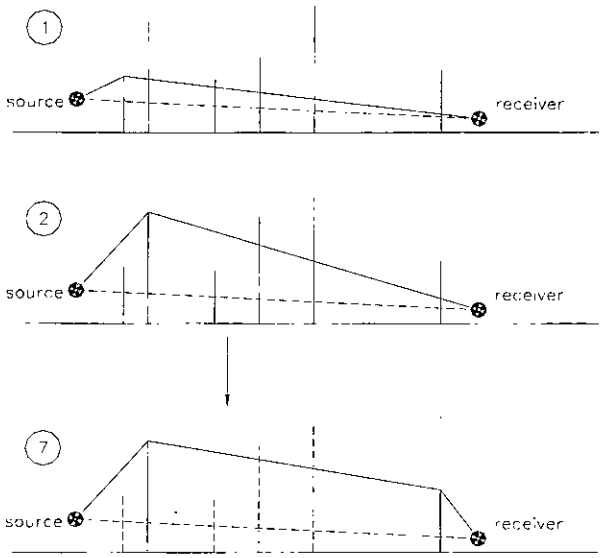

Figure 9: Method 3 for the calculation of the screened sound contribution with many screens

Figure 10 shows the lines of equal equivalent sound pressure levels in the vicinity of the subject road with a building of 10m height approximately 10m distant.

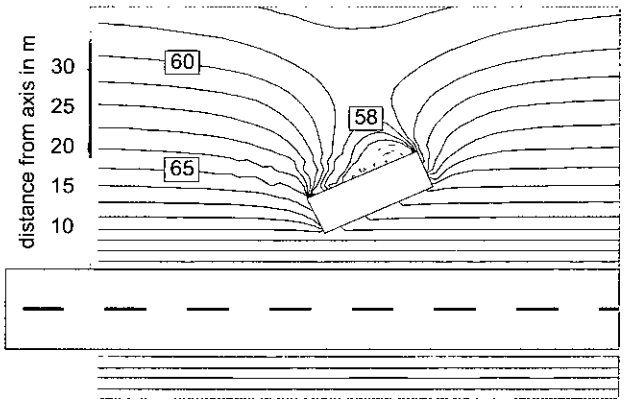

Figure 10: Lines of equal equivalent sound pressure level when 600 passenger cars per hour are passing at 80 km/h and the screening effect of a building with 10m height is taken into account

Where there are more buildings, method 1 is used to calculate noise levels in the shadow zone. **Figure 11** shows the result of such a calculation for two buildings at the side of the road.

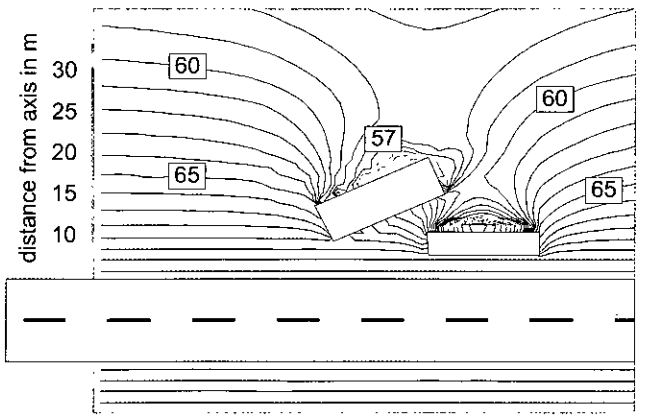

Figure 11: Lines of equal equivalent sound pressure level when 600 passenger cars per hour are passing at 80 km/h and the screening effect of two buildings with 10m height is taken into account

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Calculating and assessing road traffic noise

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The calculation of reflections

Objects like buildings or walls can increase noise levels by reflections. In the noise maps in **Figures 10** and **11** no such reflections are taken into account, so the model simulates the effects of an absorbent coating on the surface of the buildings.

The calculation of reflections can be made using the mirror image method. **Figure 12** shows the principle of this method with three walls W_1, W_2 and W_3 and a third-order reflection between source and receiver. If the original source is mirrored at wall W_1, this mirror image Q_1 at wall W_2 and the new mirror image Q_2 at wall W_3, we get the position of image Q_3. The distance between Q_3 and receiver IP is equal to the length of the real path Q_0 - P_1 - P_2 - P_3 - IP. With the absorption coefficient α of the walls, the sound intensity is weakened by a factor $(1-\alpha)$ at each reflection point. If one or more objects M are crossed by the reflected ray, screening has to be taken into account additionally by one of the methods already described.

Figure 12 explains the principle of the calculation with a point source. When the source

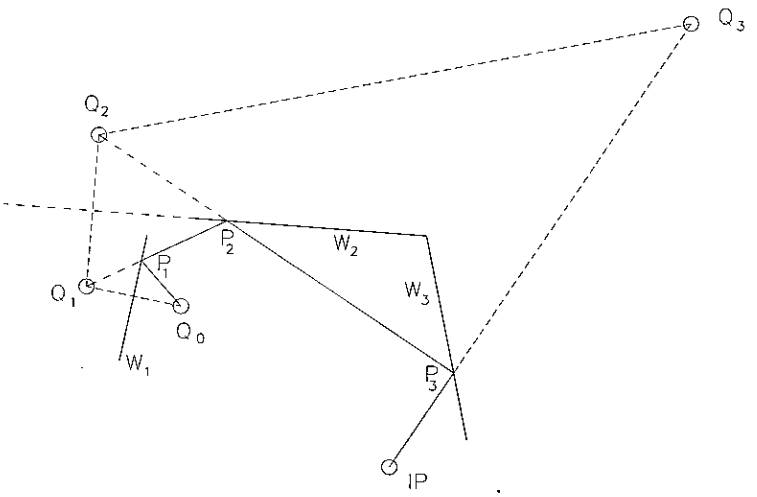

Figure 12: Calculation of a reflection of third order from source Q_0 at the receiver IP with the image source method

is extended like a road (a line source) or a parking area (an area source) this extended source must be subdivided into sufficient numbers of small elements, and these are substituted with point sources for the calculation. Two steps are necessary to ensure reasonable accuracy.

First, the extended source is subdivided by lines projecting all objects to it. Second, each resulting element is subdivided further, if its distance to the receiver point is less than twice the largest dimension of the element. Without the second subdivision, the smallest necessary extension would define the general extension of all elements. The dynamic subdivision is necessary to keep calculation times for extended sources like roads acceptable.

Figure 13 shows all the rays calculated to obtain the sound pressure level at receiver point I1. The subdivision of the road is achieved in a single step, because there are no barriers between road and receiver point, but in this case the buildings at the other side of the road demand a reflection calculation, and these rays contribute to the resulting sound pressure level.

If the noise level has to be evaluated in a more complex situation such as that shown in **Figure 14**, the number of necessary calculations increases rapidly with the number of reflecting surfaces and the order of reflections.

Figure 14 shows only the rays that are not screened. The presentation in **Figure 15** of all rays that have to be taken into account for just a single receiver point reveals the complexity of noise mapping when reflections of high order are taken into account.

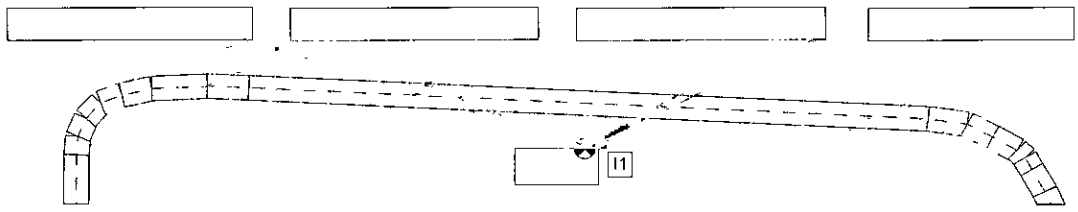

Figure 13: Calculation of equivalent sound pressure level for point I1 with road and reflecting buildings at the other side. Each of these rays represents one calculation with the sound power level of the relevant element of the road

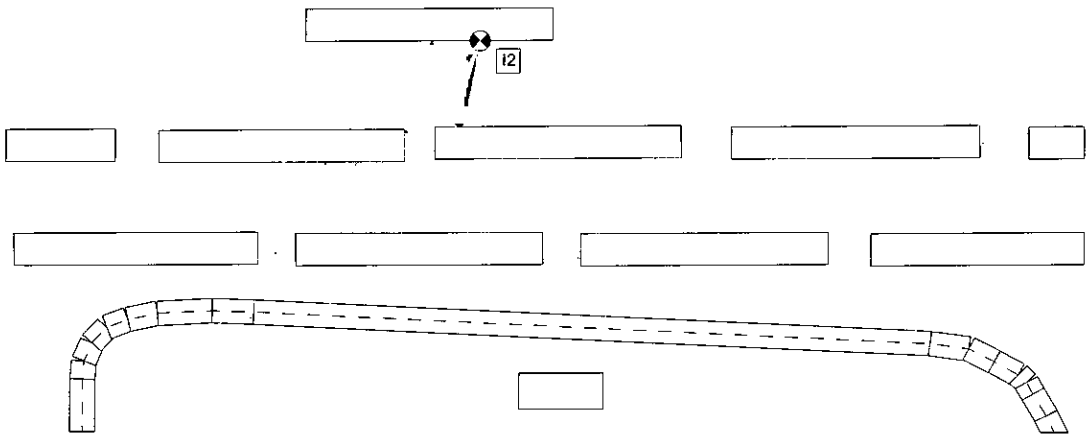

Figure 14: Calculation for immission point I2 with reflections to the 10th order

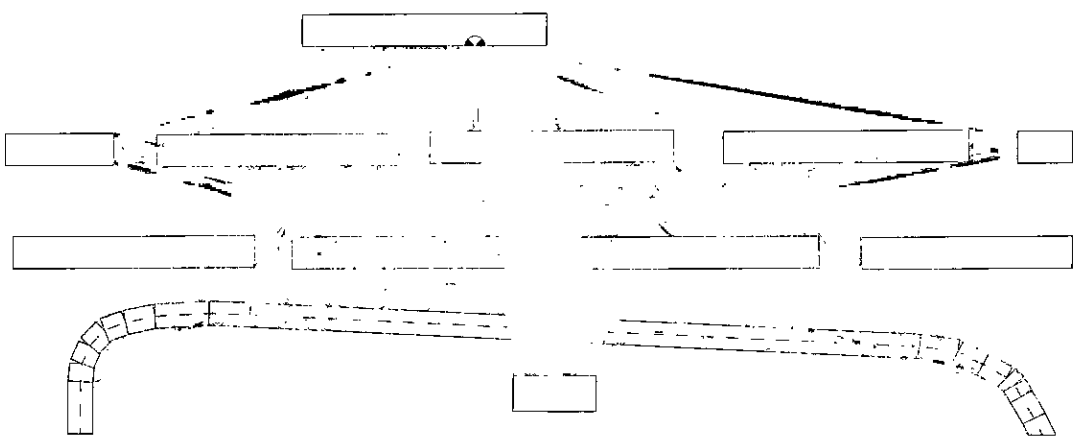

Figure 15: All rays (screened and unscreened) that have to be taken into account when the noise level at I2 is calculated with reflections to 10th order

Usually when noise maps for cities are produced, reflections are neglected, or calculated for the first order only in a restricted area around the sources. If a detailed analysis is necessary of a limited region such as that shown in **Figures 14** and **15**, reflections of higher orders must be taken into account.

Evaluation and assessment of a noise climate using a noise map

When a noise map is produced, the calculation is repeated for a grid of receiver points generated automatically. The time needed for the calculation of noise levels at each of these points depends on many factors, including the way in which extended sources are subdivided, the highest order of reflections, the hardware used, and not least, how well the software is written.

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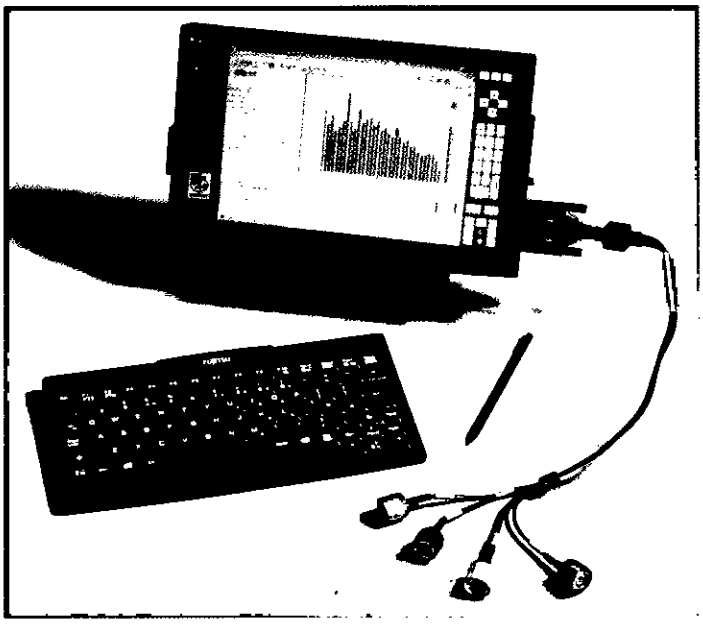

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Calculating and assessing road traffic noise

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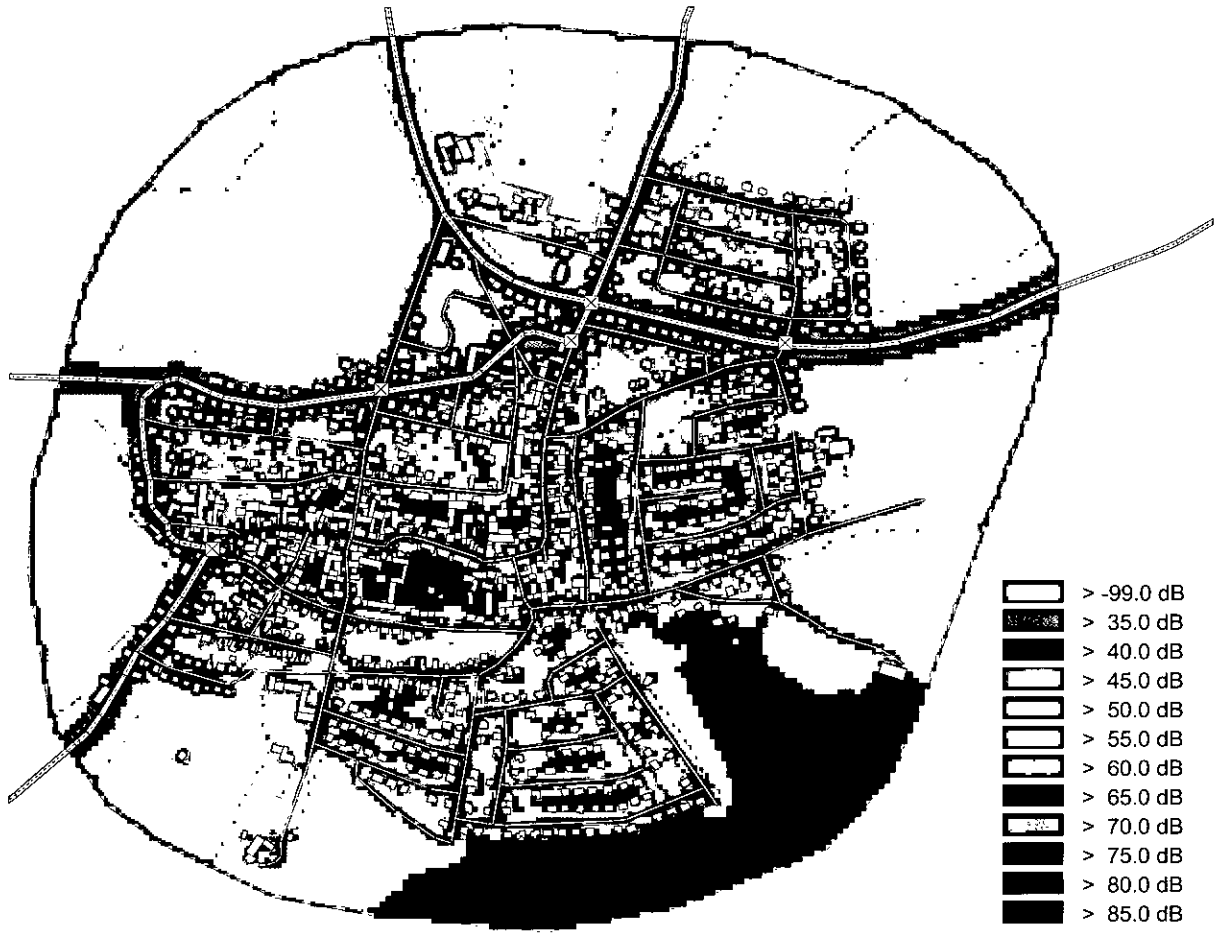

Figure 16: Noise map of a small town of 13000 inhabitants - calculated with a grid of 10m and with 23000 points

Figure 16 shows a calculated noise map for a small town, where the inhabitants experience noise from about 16000 cars in a 24-hour period passing through the northern part of the town. With the new *Program Controlled Segmented Processing* (PCSP) techniques the calculation for this area took about six minutes, but in general the time would depend on the efficiency of hardware and software.

Such a noise map is very easy for consultants, planners and local authorities to use. The existing situation can be thoroughly investigated, and possible alternatives and improvements can be assessed.

In order to assess impacts, the complete region is subdivided and for each area the number of residents is determined. The distribution of inhabitants can also be estimated from the noise map file by scanning over the grid and summing the numbers of people in all houses estimated from the dimensions and height of each house.

In the example shown in **Figure 16,** this estimate yields values of 925 houses and about 13000 inhabitants.

There are some key parameters for the evaluation of such a situation. One is the number of people living in an area with equivalent noise levels exceeding 65dB(A), because of the adverse effects on health and well-being. By scanning over the map it can be found that 1072 persons fall into this category by day, and 273 by night.

If different scenaria are to be compared with regard to the noise exposures of inhabitants, two area-specific variables should be included. The variables are the number of inhabitants P_i and the noise level L_i for each area element i. An important parameter is the limiting value L_{lim} for the maximum equivalent sound pressure level.

One evaluation formula for the total noise load of a region is

$$NL = \sum P_i \times 10^{k \times (L_i - L_{lim})}$$

where the summation is carried out for all area elements in the region. The constant k defines the steepness of the function and should be derived from the increase of annoyance with increasing noise level. With $k = \log(2) \approx 0.03$ an increase of 10dB doubles the value of NL. Although this

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Calculating and assessing road traffic noise

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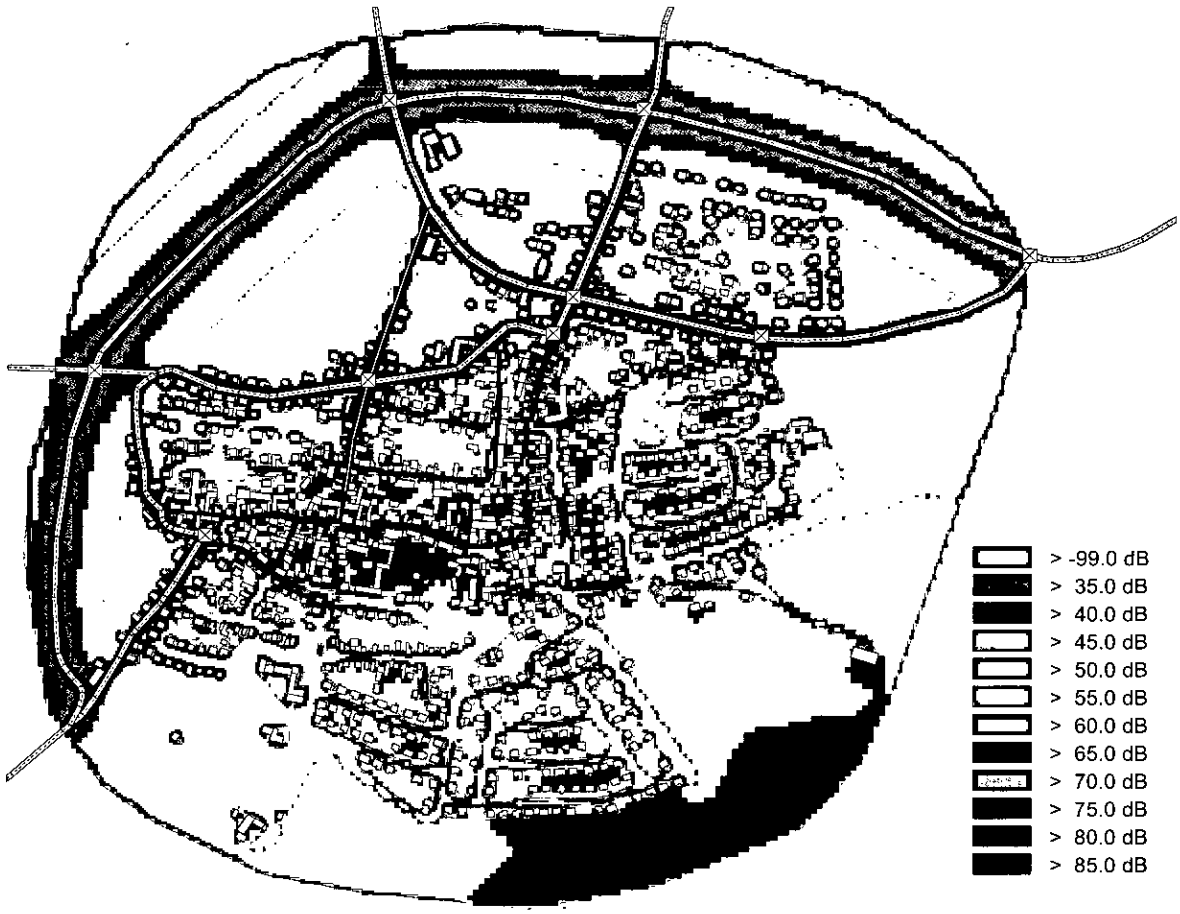


Figure 17: Noise map with the bypass solution and the main traffic on the perimeter road

approach seems to underestimate the increase of annoyance with increasing noise level, it is often used, and it is therefore instructive to apply it to the noise map in **Figure 16.**

The map was calculated with a 10m grid. The above expression is calculated for each 10m × 10m element and the results summated. The final results are

$$NL_{day} = 9485 \quad NL_{night} = 10987$$

The situation at night is therefore more severe than during the day.

Effect of a road scheme

The improvement that could be achieved if a planned by-pass were built can now be assessed.

Using the same example, a further noise map is calculated as shown in **Figure 17.** Road traffic now predominantly uses the new northern by-pass.

The evaluation scan over this map gives the following results:

Only 11 persons live with a noise level over 65dB(A) during the day, and two persons at night.

The *NL* values are now

$$NL_{day} = 572 \quad NL_{night} = 658$$

The projected scheme will give a dramatic improvement in noise levels. This conclusion might seem obvious in this example, but the technique of evaluation by a single-figure rating also works with much more complex alternatives.

Conclusions

Traffic is the main reason for excessive noise in residential areas. With modern software it is possible to calculate the noise levels by taking into account the traffic flow, the topography of the environment, and screening and reflections caused by buildings and other objects. Such a noise map gives a quick overview of the complete noise climate in a city and permits a very detailed analysis where this is necessary. When different planning alternatives are to be evaluated, this can easily be done by calculating and summating the noise levels in defined regions. Noise maps are a highly efficient information system for city planners and all those who have to deal with noise abatement in residential areas.

The basic calculations and Figures reproduced in this article were made with the computer program Cadna/A distributed by Scantec.

W Probst, and B Huber, Datakustik GmbH, Gräfelfinger Strasse 133a, D-81375 Munich, Germany

Code of practice on the control of noise from pubs and clubs

John Hinton and Dawn Connor report on progress to date

Although the attempt to develop a code of practice on the control of noise from pubs and clubs has a long and tortuous history, members of the working party set up to undertake this objective believe that the beginning of the end is now in sight. It is perhaps appropriate, therefore, at this point to present a resume of what has happened and what is planned for the future.

In 1995 a Noise Council survey highlighted the need for a number of codes of practice, including one to address the problems of noise emanating from entertainment premises. To take up this challenge the **IOA's Environmental Noise Group** (ENG) held a number of workshops. The general consensus was that a code of practice was indeed required, and that this should be as prescriptive as possible. Subsequently, an IOA working party was formed in 1996, consisting of members from local authorities and consultancy firms.

In 1997, a request for 'trade' representation on this working party was made through the **Brewers and Licensed Retailers Association** (BLRA) and accepted by the IOA, so that a jointly agreed document could be drafted. For about two years considerable efforts were made by both sides to produce such a document, but by September 1999 it had become abundantly clear that there were a number of fundamental issues on which agreement would not be forthcoming. Unfortunately, the BLRA then saw fit to tender the trade representatives' resignation from the working party.

The remaining members persevered and a final draft document was published for consultation at the IOA's *1999 Autumn Conference*. In summer 2000, the comments received were reviewed and appropriate revisions made to the document. However, one important issue which still remains unresolved concerns the noise criteria that should be included. During the working party's life, many different proposals for these have been made.

In 1998 trials of the criteria that had been 'pencilled in' to the initial drafts were undertaken. Further trials, this time of the criteria that appeared in the final draft document of autumn 1999, were carried out that autumn and winter. Unfortunately, neither the trials nor results of the consultation process provided sufficient data to draw absolute conclusions about the suitability or otherwise of any of the criteria proposed by the working party; nor was there sufficient evidence for the working party to propose alternative criteria. This was the case despite the admirable efforts of those local authorities and consultancies which participated enthusiastically in the trials.

A decision had to be made, with help from the IOA's **Environmental Noise Group**, on how to proceed with the code. Although the original mandate from the ENG was that prescriptive criteria should be included, it is felt that insufficient information is available, and there is not enough consent amongst practitioners, for this to be a practical option at this stage. The working party therefore intends to produce a code of practice without specific noise criteria, and continue consultation to determine what these should be. At some time in the future, with a better consensus, the working party will produce annexes to the code that will present the criteria, and specify protocols for undertaking noise measurements and calculations for their application.

The code of practice, without criteria, will be published shortly and will be available from the IOA. It is then proposed that following the next meeting of the working party (February/March 2001) a consultation document on criteria will be published on the IOA web site. It is hoped that this action will provoke further discussion, research and experimentation.

Members of the working party, under ENG's auspices, express their sincere thanks to everyone who has commented on the draft code and participated in the trials. However, as this article points out, there is still some way to go before we have a code of practice on noise from pubs and clubs which includes specific noise criteria. Nevertheless, the publication of a code without criteria, but containing a clear commitment to develop such criteria in the near future, must be a step in the right direction.

Building Acoustics Group/North West Branch
Half Day Workshop

Implications of Proposed Changes to the Building Regulations

Introduced by
Professor Bob Craik, Heriot Watt University
and
Dr Les Fothergill, DETR

Tuesday 3 April 2001

1.30pm

Salford University

The DETR proposes some of the most significant changes ever made to the Building Regulations and Approved Document E. The implications go well beyond that of simple changes to the Approved Document.

Key issues include:-

- Expanding the definition of noise in the Building Regulations to cover Welfare as well as Health
- A pre-completion sound insulation test for dwellings
- A new way of assessing Sound Insulation (Dntw + Ctr)
- Inclusion of a horizontal impact sound insulation standard
- Internal sound insulation requirements within dwellings
- External façade responsibility moved from LA Planning to LA Building Control and required envelope constructions
- RT requirements in common areas
- Expansion of the application to cover hostels, hotels, boarding houses, student residencies, nursing homes, etc
- Building Regulations coverage of schools (Based on BB87)

Speakers will examine the document from a number of different perspectives, examining the impact on local authorities, developers and contractors, and on the design process.
Meeting Organiser - Nick Antonio, Arup Acoustics Tel: 0161 228 2331

Approved Document E - Tuesday 3 April 2001

Name _____

Address _____

Tel: _____ Fax: _____ email: _____

Please register me as a delegate. Fee does not include lunch. Cancellations are payable in full.
❑ Fee for Author & Members £50 + VAT = £58.75 ❑ Fee for all others £60 + VAT = £70.50
❑ I enclose cheque/credit card details for the full amount.
Please give a purchase order number if you need to be invoiced

One-Day Meeting

Organised by the London Branch

Noise in London

Wednesday 23 May 2001

Commonwealth Conference Centre, London

Noise is an inevitable consequence of life in big cities and means must be found for controlling it or minimizing its effects. London is undergoing widespread development of buildings and infrastructure. Traffic by road, rail, and air is increasing; noise from industrial, commercial, and domestic sources is becoming more prominent; and the expectation of those living and working in the capital for a quiet life is higher than it has ever been before.

Since the GLC's London Noise Survey in the 1960's 'Research into Noise Levels in London' and publication of their guidelines in the 1970's, there has been limited co-ordinated research into noise levels or predicted noise levels in the capital. The creation of the Mayor of London and the Greater London Authority allows an opportunity for the first time for many years to develop a plan for the whole of London. The GLA is currently consulting widely about its Noise Strategy. This meeting is intended to complement the GLA's procedure and highlight the particular problems that face acousticians in London and possible solutions to them.

The Organisers are seeking offers of presentations. Brief abstracts should be sent before **23 March 2001** to

Tony Garton
London Borough of Southwark,
The Chaplin Centre,
Thurlow Street,
London SE17 2DG
Tel: 020 - 7525 5763
Fax: 020 - 7525 5768
e-mail: londonioa@aol.com

QUESTIONNAIRE

A JOINT IOA/IMechE SURVEY OF NOISE RELATED ISSUES IN INDUSTRY

The Institution of Mechanical Engineers and Institute of Acoustics are aiming to publish a technological guide for practitioners on *'reducing noise in industrial machinery'*. We would very much appreciate your input, by taking a few minutes to complete this survey and return by fax to the Institute office Fax No: +44(0) 1727 850553

Name:	Job title:
Company Name:	
Company Activity/Product:	
Approx. turnover:	Approx no. of employees:
Tel:	e-mail:

1. Please briefly describe one or two of the noise related issues that you have experienced. If you are experiencing no problems, then it would be useful to know that this is the case.

Problem	**Estimated annual cost**

2. Please indicate the importance of the following factors in causing your noise problems and state any others that you think are important.

Factor	**Not important**	**Moderately Important**	**Very important**
Health and Safety Regulations			
Customer Requirements			
Environmental Regulations			
Insurance Company Requirements			
General Product Development			
Equipment Supply Regulations			
Other:			

3. Please tick the technical issues that are involved in your noise problems.

Machine design		Maintenance		Specifying noise		Vibration	
Material selection		Air- movement		Building acoustics		Enclosures	
Others:							

4. If you use any of the following sources for information on noise please indicate how useful you have found them.

Source	**How often used**			**How useful are they?**		
	Never	**Yearly**	**Weekly**	**Bad**	**Fair**	**Good**
Equipment suppliers						
Trade associations/buyers guides						
Internet						
Text books (which?)						
Other:						

Thank you for taking the time to fill this in. If you have any further comments, please put them on a separate sheet.

INSTITUTE DIARY 2001

22 MAR
Medals & Awards, Council, *St Albans*

2-3 APR
WISP 2001, Speech Group, *Stratford-upon-Avon*

3 APR
Implications of proposed changes to the Building Regulations, Building Acoustics Group, *Salford University*

9-12 APR
Acoustical Oceanography, Underwater Acoustics Group, *Southampton*

26 APR
Examiners Meeting, *St Albans*

27 APR
CCMOHAV Exam, *Accredited Centres*

15 MAY
Research Committee, Professional Development Committee, *St Albans*

18 MAY
CCWPNA Exam, *Accredited Centres*

22 MAY
CCMOHAV Advisory Committee, *St Albans*

23 MAY
Noise in London, London Branch one - day meeting & IOA AGM, *London*

24 MAY
Meetings Committee, Publications Committee, *St Albans*

31 MAY
Distance Learning Sub Committee, Education Committee, *St Albans*

5 JUN
Engineering Division Committee, *St Albans*

6 JUN
Long Term Noise Measurements, Measurement & Instrumentation Group, One-day meeting, *East Midlands*

7 JUN
Membership Committee, *St Albans*

8 JUN
CCENM Exam, Accredited Centres

12 JUN
CCWPNA Advisory Committee, *St Albans*

14-15 JUN
Diploma Examinations, *Accredited Centres*

19 JUN
The Emerging Role of BS4142 Environmental Noise Group, *University of Strathclyde*

28 JUN
Executive Committee, *St Albans*

28 JUN
Machines - What's all the Noise About, Industrial Noise Group, *The Wirral*

5 JUL
Medals & Awards, Council, *St Albans*

12 JUL
CCENV Advisory Committee, *St Albans*

23-24 JUL
Bio-Sonar & Bioacoustics Symposium, Underwater Acoustics Group, *Loughborough*

6 SEP
Meetings Committee, Publications Committee, *St Albans*

11 SEP
Professional Development Committee, *St Albans*

13 SEP
Distance Learning Sub Committee, Education Committee, *St Albans*

18 SEP
Engineering Division Committee, Research Committee, *St Albans*

20 SEP
Membership Committee, *St Albans*

4 OCT
Executive Committee, *St Albans*

11 OCT
Medals & Awards, Council, *St Albans*

25 OCT
Meetings Committee, Publications Committee, *St Albans*

26 OCT
CCENM Exam, *Accredited Centres*

30 OCT
Professional Development Committee, *St Albans*

1 NOV
Distance Learning Sub-Committee, Education Committee, *St Albans*

6 NOV
Engineering Division Committee, *St Albans*

8 NOV
Membership Committee, *St Albans*

9 NOV
CWPNA Exam, *Accredited Centres*

14-15 NOV
Autumn Conference, Environmental Noise & Measurement & Instrumentation Groups, *Stratford-upon-Avon*

16 NOV
CCMOHAV Exam, *Accredited Centres*

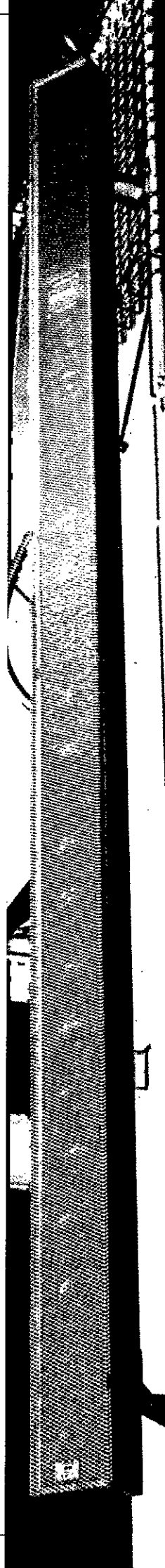
16-18 NOV
Reproduced Sound 17 Electroacoustics Group, *Stratford upon Avon*

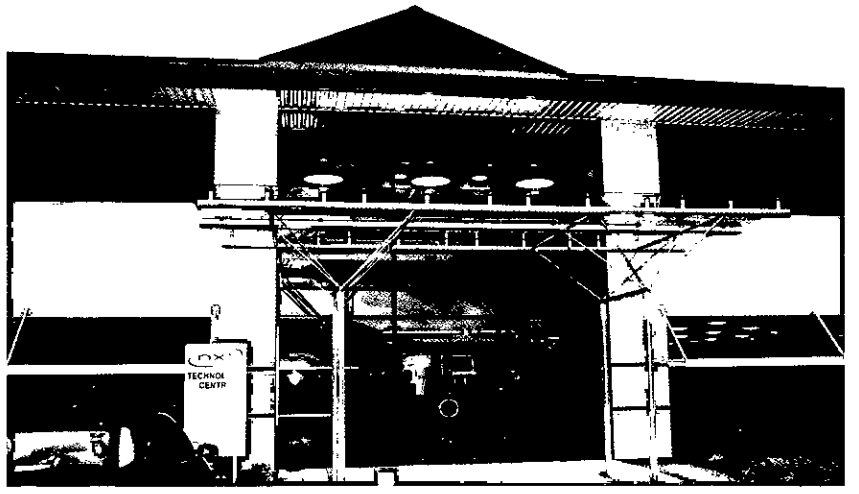
22 NOV
Executive Committee, *St Albans*

27 NOV
CCENV Advisory Committee Meeting, *St Albans*

4 DEC
CCWPNA Advisory Committee, *St Albans*

6 DEC
Medals & Awards Council, *St Albans*





Entrance to new NXT Technology Centre

FLAT PANEL SPEAKER TECHNOLOGY

John W. Tyler FIOA visits NXT Ltd

The first report in this series described a visit in 1995 *(reported in the Nov/Dec issue)* to Celestion International, the loudspeaker manufacturers. At that meeting I first met Graham Bank who was then Research Director. Two or three years later Graham moved on to join New Transducers Ltd at Huntingdon and it was while speaking to him at the IOA *Reproduced Sound 16* conference at Stratford that the idea of visiting NXT was mooted. Graham kindly arranged with Henry Azima, Chief Technology Officer at NXT, for me to visit Huntingdon. This took place last December and, in view of my life long interest in audio engineering, particularly loudspeakers, the journey to Huntingdon was made with pleasurable anticipation.

NXT distributed mode (DML) technology

For those not familiar with the new technology which this company has developed and is continuing to develop, a brief outline of the principles should be helpful. Yet the new speaker concept has made such an impact in the audio world, including the areas of HiFi and Home Theatre, that such an introduction seems hardly necessary.

In its simplest form, a DML is a flat, thin and light panel that efficiently radiates acoustic energy by sustaining bending waves, rather than by pistonic motion, the principle of cone type speakers. An optimally designed DML can be shown to support high density bending waves across its entire surface, radiating an essentially flat acoustic power over a broad frequency range of 8 octaves or more. An exciter attached to the panel, usually electromagnetic but could also be piezoelectric, or other types of tranducer, initiates the bending waves.

This class of loudspeaker produces radiation that is considered to be temporally and spatially diffuse with a substantially uniform directivity. Research suggests that DMLs interact less severely than conventional speakers with reflecting room boundaries, therefore reducing the associated colourations.

Panels can be produced from a large range of materials, including transparent, and the design techniques developed by NXT allow them to model and predict the performance of particular combinations and panel sizes. The panels have a wide range of applications apart from the obvious one of domestic audio; these are discussed later.

About New Transducers Ltd (NXT)

A summary of the history of the company and its decision to do research and sell licences to customers, rather than go into large scale production of speakers, will set the scene for the description of the tour of the new Technical Centre.

Origins

To quote Henry Azima, Chief Technology Officer: "The potential for complexly vibrating panels to act as loudspeakers emerged serendipitously in the course of research conducted by Dr Ken Heron of Britain's Defence Evaluation & Research Agency (DERA) into the use of lightweight composites in military aircraft. After discovering that composite panels acted as efficient sound radiators and conducting further research, DERA filed in 1991 the first patent application for a panel loudspeaker based on this principle. As DERA itself was not best equipped to realise the concept's potential they advertised in the *Electronics Weekly* for a company to take forward the idea".

To go back a bit; after a period in Canada, Henry Azima returned to the UK in 1980 as technical

director with Mission Electronics, founded by his brother Farad Azima in 1977. Then, the firm was very small and after many years of hard work the company became multinational. In 1992 Mission merged with Wharfedale, and took over Quad and a number of hi-fi leading brands and revitalised them, in the course of which the company became public. Of interest is the fact that Mission also bought and restored Premier Drums, well known in the music world, thus ensuring a stake in the music industry.

The group became known as Verity Group plc, which applied for and was granted a licence from DERA to develop the technology for commercial use. At that time Henry Azima was in charge of all the group R&D at Verity Laboratories and so it came under his wing. Research at Verity identified the key operating principle for loudspeaker use and by 1995 had mathematically modelled it. The early developments were so encouraging that a presentation was made to top management of Verity Group. They were impressed but decided that it was too big a project for the group to design and manufacture the panels and that the best way forward was to do the research and development and licence the ideas to outside manufacturers. Thus New Transducers Ltd, now known as NXT Ltd, was launched in the City in 1996.

A corollary to this was the decision to concentrate the Group's activities on R&D and so the manufacturing elements of the group were gradually sold off, leaving the research on panel speakers and the sale of licences as the sole company activity.

Penetrating the marketplace

As would be expected, there was considerable scepticism from manufacturers of conventional loudspeakers and others in the field. NXT set out on a serious 'paper' campaign to convince people that flat panel speakers were a practical proposition. They did this by presenting the new technology on the conference scene and by bringing on board several influential people. Major launches in Japan, UK, Germany and the USA created world wide interest; at the same time the breadth of their research was increased.

The marketing is still ongoing but NXT has proved that the technology works and is confident that it will be firmly established. The company launched its campaign with 21 patents, affectionately known as 'the gang of 21', and since then has taken out 150 more. This is necessary to protect future revenue streams that will form the returns on investment. Three people work full time in the patent field.

After the 'idea pushing', came the need for marketing and a new Chief Executive, David Pearson, was recruited in March 2000 to translate the research into licenses, changing the emphasis to technology transfer. Thus ensuring that the IP and knowledge resident in NXT is transformed into marketable products and would bring in the royalty revenue.

Current achievements

Over the last four years, NXT has sold licences to and provided technical training to a large and varied range of manufacturers, dealing with products as diverse as mobile phones, surface transport vehicles, computers and peripherals, industrial, scientific and medical equipment to name but a few. The total number of licensees is now over 200, including such well known names as Acer, Bang & Olufsen, Ericsson, Elac, Fujitsu, Goodmans, Grundig, Harman, Lego, Matsushita, Mission, NEC, Philips, Siemens, Tannoy and Wharfedale. Of interest to IOA members is the use of DML panels in ceilings as part of a public address system. Peter Mapp, a well known IOA member, is working with NXT on this type of application.

There are two main categories of DML panel, which are known as **SurfaceSound** - the original NXT panel loudspeaker technology - and **SoundVu**, which uses transparent substrates, invisible excitation and works in close proximity to a rear boundary; an obvious application being its use in front of a TV or computer screen.

A comprehensive licensee support system provides continuous help in the process of technology transfer at any level the customer requires; initial training, ongoing technical advice, prototyping and evaluation of prototypes. Training takes place in a dedicated room and includes hands-on teaching of **NXT's PanSys** panel design and simulation software.

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Selection of NXT prototype flat panel speaker designs

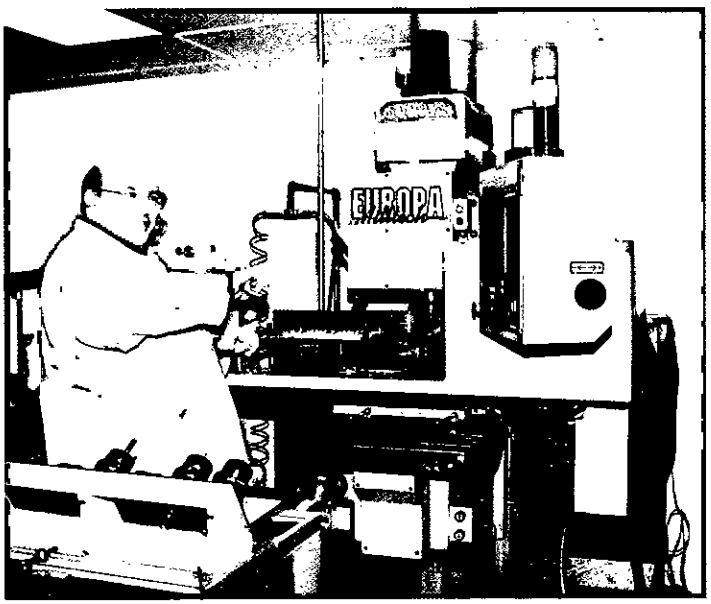
FLAT PANEL SPEAKER TECHNOLOGY

continued from page 29

A large collection of designs that have eventually gone into production is on display in the Technology Centre; a selection can be seen in the photograph on the previous page.

Speech research

Another arm to NXT is a group of scientists in Malvern carrying out research on speech. Initially, DERA was working on speech research for communication in military vehicles/aircraft. After a long period of negotiation NXT created a joint venture with the Ministry of Defence, which Henry Azima claimed was the first of its kind. The company, called **2020SPEECH Ltd** - a nice touch - is 51% owned by NXT and 49% MOD. Its mandate is to provide enabling technology and to convert the knowledge to commercial applications; the link between speech and loudspeakers is there. 2020Speech Ltd has recently signed an agreement with the BBC to develop speech processing for broadcasting. One likely use is for the automatic generation of subtitles during live broadcasts on television.



Richard Cowell with CNC computer controlled machine tools for fast and accurate prototyping in wood and metal

Global representation

In addition to the NXT Technology Centre, 2020Speech Ltd and the Head Office in Ixworth Place, London, New Transducers Ltd is represented world-wide by NXT Germany (Hamburg), NXT Asia Pacific (Japan), NXT Hong Kong and NXT Americas (California and Detroit).

The Technical Centre

On arrival at NXT, I was welcomed by Ted Jarvis, a member of staff very involved in the patent protection side of NXT's activities and who also had a great deal to do with the installation of the company in its new Technical Centre in Huntingdon in June last year. He was thus well qualified to take me round the building on a tour that provided a fascinating insight into the workings of this company, at the cutting edge of research into the new loudspeaker technology.

Licensee support

Outside the room where licensees are trained Ted explained the procedures to me. First of all, licensees pay a fee that allows any number of their staff up to 8-10 to come into NXT and be provided with support. The support team decides which is the best course for the licensee; for example he might not want to manufacture anything himself but might just want the technology – a one to one-and-a-half day course would suffice.

Then a licensee might want to go through the physics of it, want to know how these items are manufactured and make certain items themselves but not necessarily the panels or exciters. There are those who want to do everything themselves, and have complete involvement in the physics, development and manufacture.

Any of these categories of customer, and others, can apply and the support team will help them; the customers come from all over the world. Ted said that no pre-reading was required, only a basic knowledge of acoustics, general mechanics and physics – and an alert brain! Knowing how an exciter works helps.

Secondly, the support team provides backup, probably the most important service. This can involve going through e-mails and faxes and receiving telephone calls etc. from people who have been on the course, gone away to make something and have come up with a problem. Ted explained that if they can solve the problem over the phone that's good; if it requires research NXT will do it; if it requires a lot of research then the customer is charged for it.

Another part of the service is that if the licensee produces a prototype or pre-production version they can send it to NXT, where it will be evaluated to see if it meets with the minimum performance requirements and if any improvement to the aesthetics or build quality or any other aspect can be suggested. Thus the licensee can go away confident that NXT thinks they are doing the right thing. That is the function of four or five people who work very hard providing what is in effect, the face of the company. In addition to this support, where the licensee feels he cannot make sufficient progress himself, he can ask NXT to take over the design to pre-production stage and, if required, manufacture the prototype for the customer.

Which brings us neatly to the production facilities at Huntingdon.

Prototype production

The capability of NXT to manufacture prototypes was impressive. Firstly, Ted explained that it was very difficult to obtain from suppliers, small sizes of sheet materials for panel construction - they talk in

continued on page 32

FLAT PANEL SPEAKER TECHNOLOGY

continued from page 30

terms of 8ft × 4ft sheets. To overcome this problem, NXT has a 150 tonne heated platen press tool, which is used to make, from the 1300 combinations of material contained on the software, smaller sandwich panels up to 800mm × 850mm to suit the requirements of licensees.

Each panel consists of one of a number of available core materials, bonded to a choice of many different surface skins using one of a large range of adhesives. Specific materials which have particular characteristics, particularly in respect of the direction in which the fibres are aligned, are bought in when required. With this machine, they can manufacture up to six panels a day using what is a standard manufacturing process which would be used in series production. A larger vacuum autoclave will make panels up to 10ft × 6ft but only at a rate of one per day.

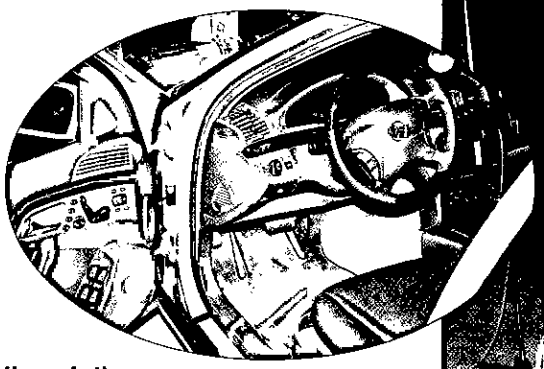
We then moved on to the well equipped workshop where CNC computer-controlled machine tools provide fast and accurate prototyping in wood and metal of parts of speaker assemblies for customers. The photograph *(see page 30)* shows the automatic machines used for this purpose.

After visiting the impressive and spacious new boardroom and conference areas we moved to a demonstration theatre where I was treated to a short film session using the Mission fs2 surround sound speaker system. I was impressed with the clarity and spread of the sound provided by such small panels; an active sub bass unit provided the lower octaves. After this demonstration I could understand the enthusiastic reviews the fs2 system has received in the technical press.

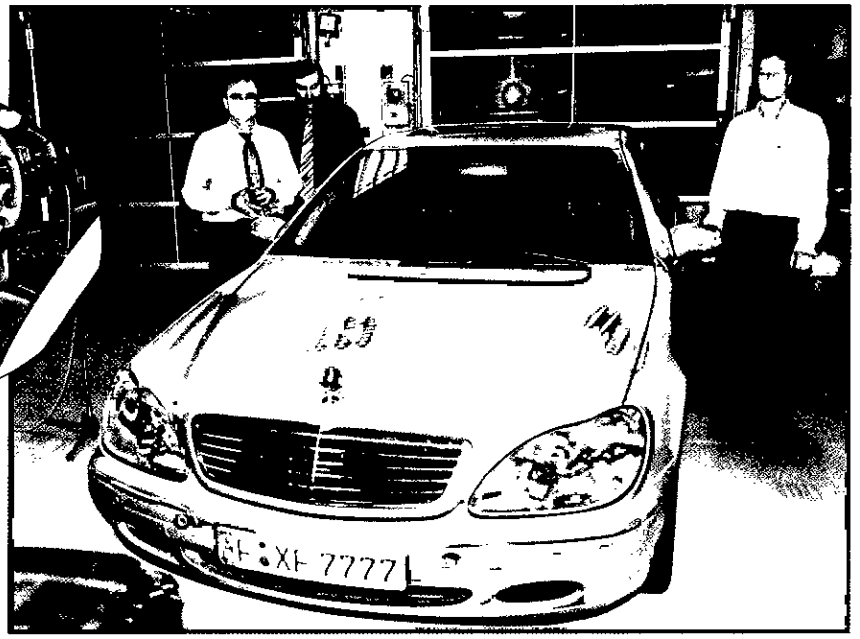
Other test facilities

Following this, we moved on to one of the two vehicle bays where cars or larger vehicles can be fitted with **SurfaceSound** panels as part of in-vehicle entertainment systems. The vehicle in the bay at the time of my visit was an S Class Mercedes and Martin Roberts, Principal Acoustics Engineer (and IOA member) explained what was going on. The photographs show the vehicle in the bay and also the interior showing the location of the DML panels in the doors and, as a centre speaker for surround sound, in the fascia. The low frequencies were provided by the standard in-car conventional loudspeakers. A demonstration showed how marvellous in-car music can sound given the right equipment – but this is high-end stuff indeed!

Then we came to the mechanical test facility. Here, laser interferometers are used to measure the important dynamic parameters which determine the panel's resonant behaviour. This non-contact method allows the determination of surface deflection while the panel is in motion. Also in this room is measured the physical characteristics of the panel materials,



Interior of Mercedes showing position of NXT panels, door and centre, (red dots) and door low frequency speakers (yellow dot)



Mercedes test vehicle (right) using NXT SurfaceSound panels. Pictured from left: Martin Roberts, Ted Jarvis and Joel Grieco

using computer controlled universal testing machines, which provide the database for the PanSys software which NXT and their licencees use to design and simulate the performance of new panels. Exciters are also subjected to extensive testing in this area.

From here it was a short distance to the two anechoic chambers, one large and one small, both of which operate accurately down to 200Hz.

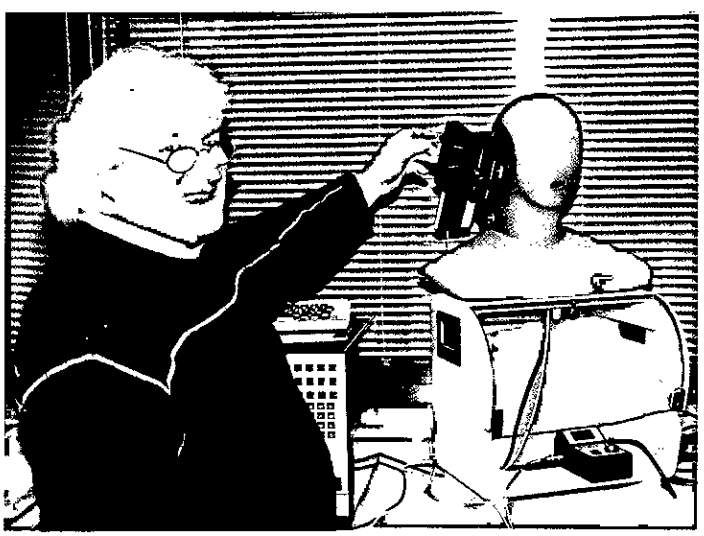
Nearby was the dummy head and torso rig used here for testing developments in mobile phones. Later I was to speak to Robin Cross about his work in this field. (Yes, the Robin we know at IOA who, amongst other things, chairs the organising committee for *IOA Reproduced Sound* conferences at Stratford. He is a part-time consultant with NXT).

Particular items of research

I was then taken to a small demonstration room to meet Paul Burton, Senior Engineer, to listen to a product he has been responsible for and which is about to go into production in the USA. This was a small cylindrical active sub-bass unit housing dual bi-amped drivers, with two very small (about 18cm × 8cm) satellite DMLs. These can be seen in the photograph (in front of a TV with integrated SoundVu panel) on page 35. Several music samples were played and I was very impressed by the high quality of the reproduced sound, notwithstanding the compact size of the system.

However, it was admitted that the set up would not cope with large rooms. Several prototypes of this design were made and demonstrated to companies likely to be interested; TDK Corp in the USA came back and expressed interest. After some further development at NXT, TDK decided to go into production with several multi-media models. The most expensive model, similar to the one demonstrated, will be on sale, not in the UK, at a unit price of $149, a remarkably low price for such a high quality design. As with so many products today they will be manufactured in China.

I then rendezvoused with Robin Cross at the dummy head and torso simulator to hear him describe the work he was doing on mobile phones. He showed me a generic mock up of a third-generation mobile phone (WAP is 2½ generation) to demonstrate what it might look like. No photographs as it is still on the secret list but he suggested I described it as a prototype sound field receiver for a third generation mobile phone, the feature of interest being the transparent SoundVu loudspeaker panel over the display window. This allows use at arms length as well as close coupled. Robin explained that the head/torso simulator had a particular type of ear simulator on it, which is suitable for this type of measurement, enabling one to get a measure of the frequency response of the receiver with various masks from a range of phones attached.



Robin Cross demonstrating the use of head and torso simulator to test new mobile phone development

I was then taken by Ted to see Julian Fordham, Senior Materials Scientist, who described and demonstrated to me PanSys, the NXT, in-house developed, design and simulation software. It is based on an extensive database of panel materials and exciters and their characteristics. These are

continued on page 35

in sound solution

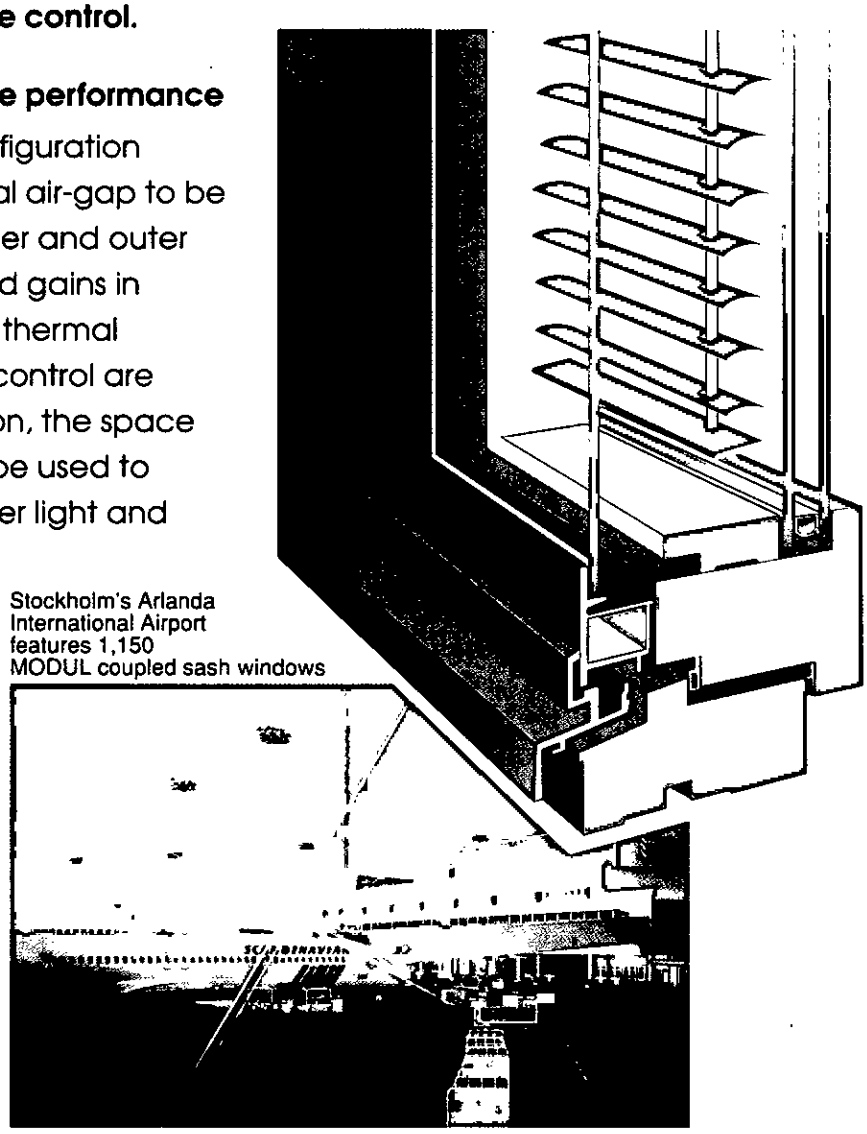
The MODUL range of windows has been developed in Sweden to give an extremely high standard of acoustic performance. Embodying first-class design, quality materials and an excellent standard of craftsmanship MODUL are the affordable solution when it comes to noise control.

Coupled Sash for superior noise performance

The MODUL coupled-sash configuration permits a technically functional air-gap to be incorporated between the inner and outer glazing units resulting in marked gains in acoustic insulation. Improved thermal efficiency and condensation control are further benefits, and, in addition, the space between the two sashes can be used to accommodate blinds for further light and heat regulation.

MODUL coupled sash windows used at the Phoenix Business Park adjacent to Glasgow International Airport

Noise from traffic at Brightwell Court, adjacent to the busy A12 at Martlesham, was controlled using MODUL windows



Stockholm's Arlanda International Airport features 1,150 MODUL coupled sash windows

MODUL
coupled sash
THE ULTIMATE WINDOW

SAMPSON

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Maitland Road, Lion Barn Business Park,
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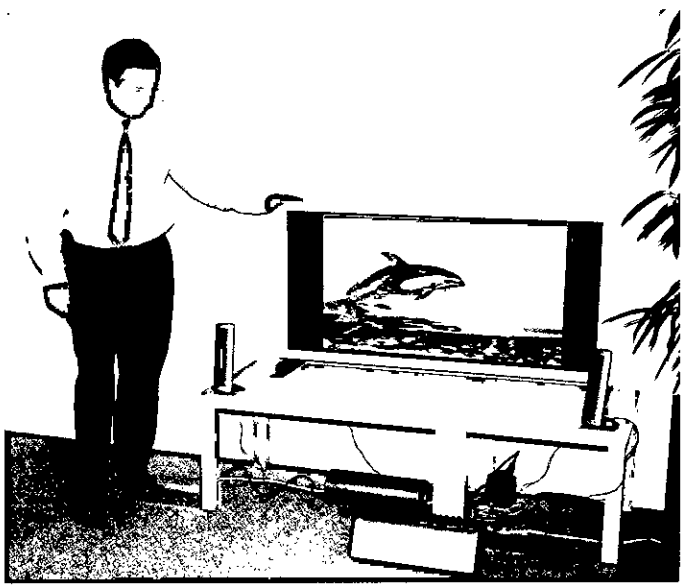
FLAT PANEL SPEAKER TECHNOLOGY

continued from page 33

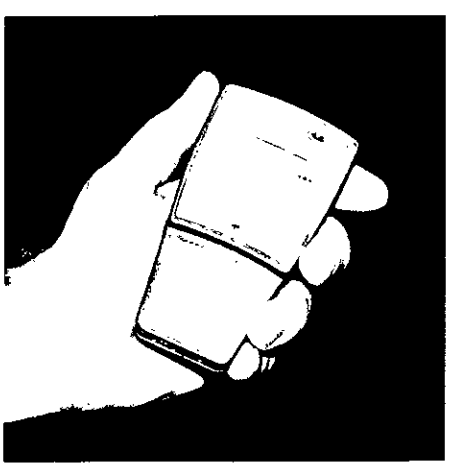
characteristics accurately measured by NXT, not those supplied by the various manufacturers. It was fascinating to see, on the computer screen, the various stages of the design process culminating in the simulated performance of the designed panel.

My final interview before meeting Henry Azima in his office was with Director of Research, Graham Bank, who described to me an item of research he was closely involved with at present. Again, this was mobile phone oriented and involved the possibility of improving the quality of phone ring tones by introducing harmonics to the fundamental tone. With current phones, which use a simple sounder, the ring note consists of a basic frequency with little in the way of overtones and hence sounds unmusical.

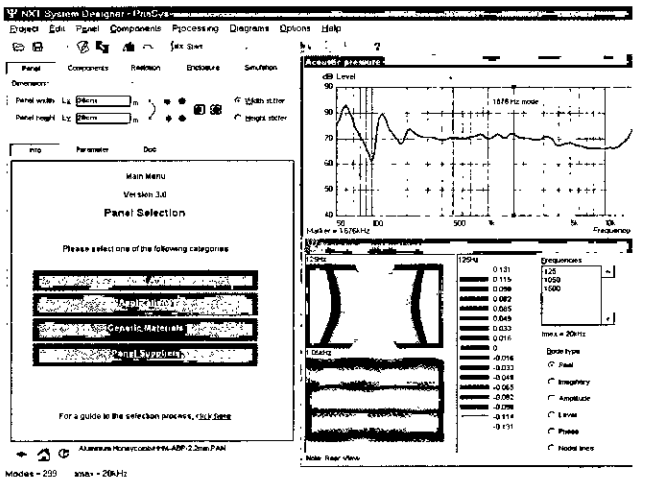


Paul Burton demonstrating the NXT stereo system design to be manufactured by TDK in the USA. Sub-bass unit on the floor at front, the two small satellites on the table in front of the SoundVu panel TV (TV not part of the demo)

With the third generation of phones likely to include an NXT panel speaker as an overlay on the display and with an eye to future youth markets, NXT is looking at ways of producing a more musical ring tone. The photograph shows the phone used for this work (Graham's hand holding it). Graham then demonstrated the effect by playing music and various ring sequences from an MP3 player connected to the phone. The difference in sound quality compared to current phones was astounding. The whole effect was so much more attractive to the ear. I think this is something that will appeal to the phone user of the future.



Third generation mobile phone mock-up using a SoundVu panel over the display; demonstration by Graham Bank of the more musical sounds available from this design compared with present phones



A screen dump of PanSys software for panel design

I then had a final discussion with Henry Azima in his office, where Graham Bank joined us. It was here that Henry described to me the history of NXT, with which I began this report. We discussed the company's products in general and plans for the future. He is justifiably proud of the new Technology Centre and his talented staff who have achieved so much in so short a time.

In discussion. Henry Azima, (right) and Graham Bank

My expectations for this visit were fully realised. I carried away the impression of a dynamic organisation at the cutting edge of a new technology, housed in a modern spacious and obviously purpose-built space. The gains have been impressive and the future is an exciting prospect. If I were 30 years younger and a lot cleverer I would apply for a post at NXT!

NXT Technology Centre is at Hinchingbrooke Business Park, Huntingdon, Cambridgeshire PE29 6FW. Tel: 0870 777 5555 Fax: 01480 437177

When planning conditions don't work....

Philip Durell AMIOA **and Robert Smith** AMIOA

As acoustic consultants we are in the enviable position of seeing planning conditions from a number of Local Authorities throughout the country. The range and style of conditions witnessed have varied considerably and this article seeks to highlight some of the more common mistakes made. However, we begin with a brief review of the history behind town planning and the reasons why conditions need to be set in the first place.

Town and country planning as it exists today has its origins in nineteenth-century concerns for the poor public health and housing affecting the majority of the general public at the time.

It was not until 1909 that the term 'town planning' was first coined in the *Housing, Town Planning Act* of that year. Attempts were made during the inter-war years to develop the system, but these did little to expand the scope of the fledgling planning system. Then, in 1947, the first specific planning legislation, the *Town and Country Planning Act*, was passed. This Act subjected all development to a system of controls exercised by the creation of development plans and a requirement to obtain planning permission.

The change from development control effected thorough zoning, where schemes were produced illustrating where certain types of development would be permitted, to a system where proposed development was evaluated in the context of a development plan, remain the enduring legacy of the 1947 Act.

Under the new system, a plan was prepared which suggested the manner in which the Local Planning Authority (LPA) believed land within its jurisdiction should be used. The development plan did not, however, imply that permission would be granted for those proposals which accorded with the principles of the plan. In reaching its decision, the LPA was required to pay

due regard to the development plan and, just as importantly, any other material considerations. Consequently the old certainty that once existed for developers had been removed, to be replaced with a new autonomy for LPAs which permitted them a degree of discretion in the decision-making process.

A number of the provisions of the 1947 Act have since been repealed. However, the basic principle of development control has been preserved and consolidated into the 1990 *Town and Country Planning Act.* Latterly, through concern over the potential impact of development on the amenity of the environment, such as the effects of noise, a considerable body of subordinate legislation and guidance has been developed in an attempt to reconcile some of these issues.

With respect to noise, the issuing of *Planning Policy Guidance 24 (PPG24)* in September 1994 'Planning and Noise', provided guidance to LPAs in England on how the planning regime could be used to minimise the adverse effects of noise. The tool by which the effects of noise could be mitigated was the application of planning conditions. But could the imposition of conditions designed primarily to control land use be adequately used to control noise issues?

In granting planning permission for land use LPAs are permitted by virtue of section 70 of the 1990 Act to impose conditions. Such planning conditions are useful for permitting what would otherwise be regarded as undesirable proposals, subject to compliance with the attached conditions. As PPG24 states:

> ***'Where it is not possible to achieve such separation of land uses, local planning authorities should consider whether it is practicable to control or reduce noise levels, or to mitigate the impact of noise, through the use of conditions....'***

The LPA has wide discretion to apply conditions as it thinks fit, but this does *not* mean 'as it pleases'. Guidance on the limits of the LPA's discretion when applying conditions is contained within sections 72 and 75 of the Act.

Over the years, judicial intervention has led to the development of a number of tests of the validity for conditions. Three of the most often cited have come to be known as the Newbury tests, following a case in which the House of Lords laid down the following principles for planning conditions. Conditions must:

- ❑ **Be applied for a planning purpose;**
- ❑ **Fairly and reasonably relate to the development permitted;**
- ❑ **Be reasonable.**

Further guidance relating to when the imposition of conditions may be acceptable in planning terms, rather than regulating or imposing legal control over the application of conditions, is contained within Circular 11/95. The Circular specifies a further six tests, namely, that planning conditions must be:

1. **Necessary;**
2. **Relevant to planning;**
3. **Relevant to the development permitted;**
4. **Enforceable;**
5. **Precise;** and
6. **Reasonable.**

The similarities to the Newbury tests are obvious. A further restriction of particular relevance to noise issues is that planning conditions should not seek to duplicate controls available under other statutes: the *Environmental Protection Act 1990* would be one such.

When considering an application for a development proposal, the LPA is under a duty to consult with a range of public bodies, the number and type depending on the specific development. Representations made to the LPA are material planning considerations and must be taken into account before the application is decided.

Where the issue of noise is raised it is usual for the LPA to seek advice from the Environmental Health Department of the local authority. Consultation with Environmental Health Departments is not a statutory requirement, but is undertaken on a discretionary basis where the LPA believes noise may be an issue. It is usually during these consultations that the need for a specific condition is suggested to the LPA. Should a condition be imposed the LPA is under a duty, by virtue of article 22 of the *General Development Procedure Order 1995,* to specify why a condition has been imposed, but failure to do so does not invalidate the condition.

The authority of any system of regulation is undermined if it does not contain adequate provisions for enforcement. Until recently the systems in place for enforcing planning law were often regarded as the weak link in the chain, many of the procedures being quite cumbersome.

As a consequence the Planning and Compensation Act 1991 introduced a number of significant changes to the system of planning enforcement. Breaches of planning control can now be controlled by means of one of four types of notice: an Enforcement Notice; a Planning Contravention Notice; a Breach of Condition Notice; or a Stop Notice.

The Enforcement Notice is the principal instrument of enforcement, but its use by the LPA is discretionary: if used, such a notice must specify the steps to be taken to remedy the breach. The notice must also specify the date on which it becomes effective, this being a minimum of 28 days from the service of the notice. Failure to comply with the notice in the specified period is a criminal offence. An appeal against the notice may be made before the notice comes into force, and lodging an appeal automatically suspends the notice.

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When planning conditions don't work....

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The LPA may also serve either a Planning Contravention Notice (PCN) or a Breach of Condition Notice (BCN), both introduced by the 1991 Act. Service of a PCN requires information relating to the use of the land to be supplied to the LPA: knowingly supplying incorrect information is a criminal offence, as is ignoring the notice. The recipient of such a notice may regard it as a warning that the LPA will take further formal action if necessary. The BCN is served in cases where compliance with a condition is deficient, and compliance is required within 28 days. There is no right of appeal against a BCN.

The final enforcement sanction available to LPAs is the service of a Stop Notice. This is issued where swift action to remedy a breach is required. Receipt of a Stop Notice makes it an offence to continue the specified activity once the notice comes into force, which may be at any date within a period 3 to 28 days from the date of service. A Stop Notice can only be served in circumstances where an Enforcement Notice exists (or when both notices are served simultaneously). Again, there is no right of appeal against the service of a Stop Notice, so if proceedings are brought for ignoring it, the usual counter is to challenge the legitimacy of the notice.

Considering the rigorous and extensive procedure that must be adhered to when specifying a planning condition, it is surprising how many do not achieve their primary goal. The following examples are based upon actual planning conditions that have been applied to various developments.

EXAMPLE 1

This development involved the re-roofing of an industrial building that contained various light industrial uses situated close to residential dwellings.

The following planning condition was imposed:

'Before the new roof is erected, an acoustic report shall be submitted to and approved in writing by the Local Planning Authority indicating the acoustic standard of the new roof structure and materials. The new roof shall be of at least the same acoustic standard in comparison with the existing structure. The development shall not commence until detailed information has been submitted to and approved in writing by the Local Planning Authority to ensure that the acoustic standard of the proposed structure and materials is comparable with the existing structure. Only the approved scheme shall be implemented'.

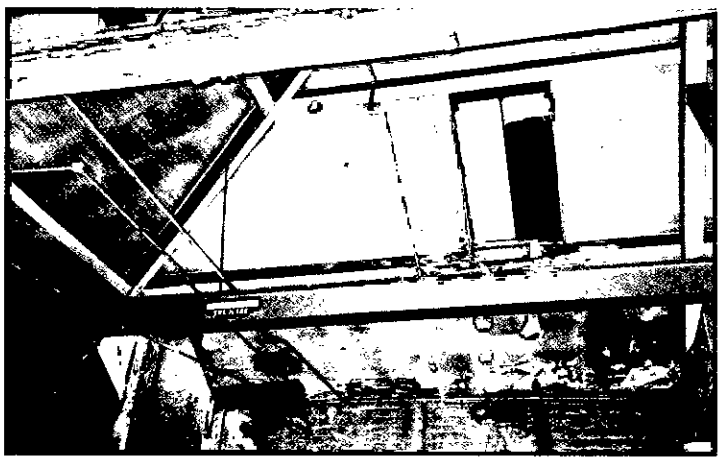
Reason for condition:

'To safeguard the amenity of and existing characteristics of the area for the benefit of neighbouring residents'.

The Local Authority rightly recognised that the new roof must contain adequate sound insulation to protect the nearby residential dwellings from excessive noise. However, the roof in question was approximately 100 years old and extremely dilapidated - which was why it was to be replaced.

Unsurprisingly, there was no record of the roof's original performance specification, and no tests had ever been conducted to establish its acoustic performance in-situ. At the time of this redevelopment, fears about the structural soundness of the roof meant that no direct access was permissible, so no testing was possible.

The poor state of the roof can be seen in the photographs: there were several holes. It would be quite reasonable to say that the sound insulation of the existing roof was negligible: an



area of cling film fitted over each hole would have fulfilled the condition! Needless to say, the intention, rather than the literal meaning, was followed, and a roof acceptable to all parties was specified.

The stipulated condition was fine in spirit, but was imprecisely worded and therefore unenforceable. It is a good example of how badly-worded planning conditions do not help to fulfil the Local Authority's original aims.

EXAMPLE 2

The following is based on conditions imposed on a development for a national distribution centre involving several hundred HGV movements in each 24-hour period. The site was in a rural area with a number of residential dwellings sparsely scattered nearby.

'Noise from the development shall not cause the 'A' weighted equivalent continuous sound pressure level dB (L_{Aeq}) measured at a height of 1.5 metres above ground level and not less than 3 metres from the façade of any building to exceed the values given within the table below at the locations shown on the plan'.

Location	*dB(A) value*
A	65
B	62
C	58
D	54

Reason for condition

'To prevent disturbance to the occupants of nearby residential properties'.

Again, this was a valid reason, and taken at face value, and leaving aside any argument regarding the suitability of dB(A) for assessment of the low-frequency content of HGV noise, it was a well-worded and precise condition. However, the noise measurement locations shown on the plan did not identify individual residential properties, but were placed at various distances from the application site, in the manner of noise contours. One advantage of noise contours, of course, is that clearly defined zones are produced: the further the contour is from the source, the stricter the noise limit.

However, the four specific locations in the condition above do not achieve that result. A number of residential properties were closer to the development than any of the measurement locations, and were thus not protected from excessive noise. Compliance with this condition could have been achieved but some residents could still be exposed to high levels of noise.

EXAMPLE 3

This final example deals with a classic mistake which still occurs surprisingly frequently.

'.... written details for the proposed sound insulation scheme must be provided to the Local Planning Authority prior to the commencement of the development'.

Of course, any scheme can be submitted to the Local Planning Authority, regardless of whether or not it meets the required specification, since with this wording the LPA has no authority to reject the proposal. The correct wording of such a condition is along the lines of :

'.... written details for the proposed sound insulation scheme must be provided to the Local Planning Authority for approval before the commencement of the development. The development must not proceed without the LPA's prior written approval of the proposed scheme'.

These are just a few of the common mistakes which can occur when planning conditions are drafted. It is hoped that this article serves to highlight some of the areas where planning may go awry. It may even lead to a review of some unsatisfactory standard conditions which have been imposed unchallenged for a number of years.

Philip Durell AMIOA, Senior Consultant, and Robert Smith AMIOA, Consultant, are employed by Philip Dunbavin Acoustics, Warrington.

NEW RESEARCH CONTRACTS

University of Hull

Professors Attenborough and Cummings are about to undertake an EU funded project concerned with sonic boom prediction. The project will investigate specific effects taking place close to the ground related to ground absorption and propagation through the atmospheric turbulent boundary layer.

Though affecting any booms, these effects are magnified by grazing propagation occurring near the sonic boom carpet cut-off and inside the shadow zone, and lead to dramatic changes in the characteristics of sonic boom. There will be collaboration with **Ecole Centrale de Lyon** (ECL) in model experiments involving turbulence and with **Marie Curie University** in Paris (UMC) in respect of numerical propagation codes. The contract will employ both a post-doctoral Research Fellow and a postgraduate Research Assistant who will be concerned respectively with theoretical/numerical and experimental activities.

University of Salford

A new project begins in March which aims to produce and test the capability of active diffusers to produce diffuse reflections in rooms, particularly to investigate their ability to produce better low frequency diffusion. Dr Trevor Cox and Mark Avis are investigators on this three year **Engineering and Physical Science Research Council** (EPSRC) funded project entitled *Room Acoustic Active Diffusers*. Sound diffusers have applications in a wide variety of spaces where quality music and intelligible speech are important. In the last twenty years much has been learnt about the design and application of passive diffusers. This application is about a radical step forward in diffuser design, the use and integration of active impedance elements. Active surfaces have the potential to overcome limitations of passive devices, most pertinent to this application is the ability to operate over a wider bandwidth and achieve better low frequency diffusion from a given depth. t.j.cox@salford.ac.uk.

Anechoic chamber doors

The anechoic chamber, originally built for the **Department of Architecture and Civil Engineering** at Bath, is due to be demolished in the next few months. The IAC access doors (two leaves of double doors) with an opening of 1740 x 2500mm high are available to anyone who wishes to arrange transport. Anyone interested please contact: m.barron@bath.ac.uk.

Engineers key to economic success....

Future engineers and technologists are the key to the British economy's success, claims the **Engineering Council.** The health of the economy is in the hands of future generations of engineers, technologists and scientists, and those who equip them, the teachers of science.

Prof Patrick Dowling, newly-elected President of the **Association for Science Education,** said at its international conference and exhibition in January 2001, that we live in a world of rapid and far-reaching change. Knowledge had become the most important asset and competitive advantage came from the application of science, skills and new ideas.

According to Prof Dowling, successful economies of the future would excel at generating and disseminating knowledge and exploiting it commercially, thus creating challenges for government, schools and universities.

He called on the government to establish an academy devoted to enabling scientists to contribute directly to school science education. This, he believed, would be a way to improve achievement in school science and also develop interest in engineering and design in schools from primary level upwards.

Speaking about the benefits science gains from better understanding of technology, he challenged schools to create better links between science and design and technology.

This was one of the main recommendations of the *Interaction report,* published by the **Engineering Council** in conjunction with the **Engineering Employers' Federation** in July 2000.

....and set for a brighter future

A brighter future beckons for British professional engineers after a trilateral agreement was signed in Paris which will pave the way for greater recognition of their qualifications abroad.

The **Engineering Council** signed the agreement - following two years of negotiations with France and Italy - which was finalised during the FEANI (European Federation of National Engineering Associations) Annual Assembly in Hamburg.

The new arrangements give British registered Chartered and Incorporated Engineers the knowledge and assurance that their professional qualifications will be recognised in both France and Italy.

It also gives engineers of equivalent status from these countries the same recognition when working in this country. British companies can be assured that French and Italian qualifications match those of Chartered and Incorporated Engineers in this country.

Malcolm Shirley, Director General of the Engineering Council, who signed the agreement alongside counterparts from France and Italy, said: "We are extremely pleased with this successful step which will create more opportunities for British engineers working abroad. It is a significant move which enhances the reputation of British engineers overseas."

Engineers who want to take advantage of this new opportunity should contact Dr Jim Birch, Deputy Manager Membership, at the Engineering Council on 020 7557 6478 or email at jbirch@engc.org.uk

Robert Blair Fellowship

in Applied Science and Technology

Applications are invited by the **Corporation of London** from British candidates over 21, who have been trained in **Applied Science in Technology.** Preference is given to engineering science and those who studied in London, or have been 'identified with the London education service'. The maximum sum available for award is £10,000.

The award of a Fellowship is for advanced study or research abroad in Applied Science and Technology. Acoustics has not yet featured.

Application forms for the 2001/2002 academic year are available from the City Education Officer, (Robert Blair Fellowship), Guildhall, PO Box 270, London EC2P 2EJ, and must be returned by Friday 30 March 2001. Short-listed candidates will be interviewed on Wednesday 25 April 2001.

DETR consults on aviation's future

The **Department of the Environment, Transport and Regions** has issued a consultation document about the future of aviation in the UK. The document is broad ranging, but there are significant points on noise issues, planning, and integrated transport of interest to many members. Comments must be received by the DETR by 12 April 2001.

The consultation document is available online at http://www.aviation.detr.gov.uk/consult/future/index.htm.

from ProsCon Environmental

IMMI 5.0 - new 32-bit version

The *IMMI 5.0* from Wolfel Measurement Systems is now available in a fifth generation 32-bit version, complete with the implementation of BS 5228 Noise and vibration control on construction and open sites.

Increased calculation speed, says UK supplier **ProsCon Environmental,** is due to 32-bit processing. An undo function is now available in graphics mode and in the element list.

IMMI has become a universal noise mapping and prediction tool for UK users. In addition to traffic noise (with CRTN and CRN), and industrial noise (IS09613) the system now includes the much-demanded BS 5228 construction and mining noise prediction method.

The implementation allows maximum flexibility with quick and convenient modelling of the scheme. Calculation of overall A-weighted and frequency-dependent levels is supported, including more precise handling of barrier effects. The user can modify the dBase format database files created by the software.

Noise levels are predicted over a grid of equally-spaced receptor points. The software then produces coloured noise maps with contours based on the grid points. For calculation at a single receptor point, the results can be obtained in list form in several different formats.

IMMI 5.0 can be used with Windows 95, 98, NT or 2000.

GSM modem system expanded

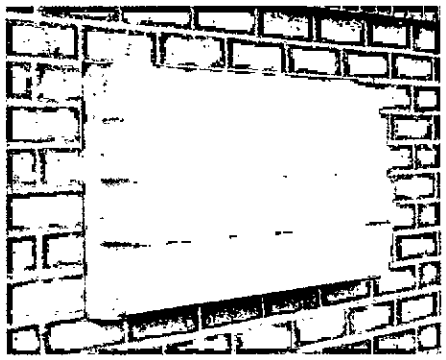
Last year, ProsCon Environmental announced the new *GSM modem system* for use with Larson Davis model 812, 820 and 870 type 1 environmental sound level meters.

The system has now been expanded to include the Larson Davis model 824 real time sound level meter. It is based on a GSM900 modem together with Larson Davis' new DNA software for instrument set-up, control and data download.

Various parameters can be monitored on-line, including L_p, SEL, and L_{eq}. The system also allows remote control of the instrument for start/stop function as well as checking battery power. All of this can be managed from the office using a PC and modem.

The model 824 is a hand-held real-time sound level meter which can measure 48 parameters at the same time. Specifically, slow, fast, and impulse time weighting; A, C, and flat frequency weighting; octave and third-octave levels can all be measured simultaneously. Statistical L_n values are also available.

Further information from: ProsCon Environmental Ltd, Tel: 01489 891853; Fax: 01489 895488
e-mail info@proscon.co.uk



from Passivent

New acoustic wall vent

From **Passivent,** which supplies ventilation products for domestic and commercial buildings, comes the *Aircool Acoustic Ventilator.* This new, controllable air intake and extract ventilator with acoustic attenuation, is suitable for any area requiring high levels of ventilation combined with sound attenuation.

The manufacturer claims a weighted normalised sound level difference of 30dB across the unit.

The internal and external ABS cowls provide high impact resistance even at low temperatures when tested to BS 6375 Part 1 1989. The ventilator is watertight to 600 Pascals external pressure in the closed position. It has a low resistance to flow when fully open and minimal air leakage when closed. The average calculated U-value of the ventilator is 2.63W/m2K when closed.

The ventilators can be controlled individually or may be linked to an overall ventilation control or building management system.

Further details from: Passivent Ltd, Tel: 0161 962 7113; Fax: 0161 905 2085.
e-mail: info@passivent.com
Web: www.passivent.com

from Hepworth Acoustics

Distributors for LIMA Software

Hepworth Acoustics has been appointed by Stapelfeldt Ing GmbH as sole distributor of *LIMA* software for the UK and Ireland. One of the leading environmental noise prediction software packages, LIMA can produce noise maps for all sizes of urban area.

Its development began in Germany in 1989, from the need to produce a program capable of noise mapping large complex areas. All major noise sources, including roads, railways, airports and industry, can be handled. The program has also been extended to other areas, such as air pollution and solar radiation.

LIMA is used to solve large scale three-dimensional problems within an acceptable calculation time without loss of accuracy. The user can, therefore, produce noise exposure maps for large towns with the desired precision.

According to new EU regulations, by December 2004 every town or city with a population in excess of 250,000 will have to be noise mapped. By December 2009 all towns with a population in excess of 100,000 will have to be modelled. To date, Birmingham is the only UK city to have been modelled in this way, and the prediction work was carried out using LIMA.

In addition to noise calculations across large scale urban environments, this is also a powerful tool for modelling and assessing smaller-scale complex situations, such as industrial sites, highway schemes and mixed environments.

With a choice of program size, and different task-centred user interfaces, LIMA provides a solution for modelling environmental noise in projects of all sizes.

Further information from: Simon Shilton, Hepworth Acoustics Ltd, Tel: 01925 579100; Fax: 01925 579150.

from IAC

Acoustic products on internet

Acoustic products manufacturer and test facility specialist, **IAC**, has launched a new web site at which product design and application data can be found. Information is divided into twelve product categories, ranging from aviation test facilities to anechoic rooms, broadcasting studios, acoustic doors, audiometric rooms, industrial, marine and power plant solutions and HVAC products.

A complete library of technical documents has been created, in the form of downloadable .pdf files, so that product specifications and acoustic performance data can be viewed quickly and clearly on screen and printed at high resolution for future reference.

The web site also contains sections covering IAC's research and development facilities, quality control systems, news items and recruitment opportunities both at home and abroad.

Contact: Dave Greggor, Tel: 01962 873000; Fax: 01962 873132
e-mail: daveg@iacl.co.uk
web site: www.iacl.co.uk

from Brüel & Kjær

Miniature triaxial accelerometer

Sound and vibration specialist **Brüel & Kjær** has launched the *Endevco model 65,* a new miniature triaxial ISOTRON accelerometer. Features include high sensitivity and high resolution.

Packaged in a small welded titanium cube measuring 10×10×10mm, this model weighs just five grams and is ideal for structural analysis applications.

Overload protected and shockproof, model 65 delivers excellent frequency response for both amplitude and phase, to provide users with a triaxial accelerometer that excels in structural and component testing, drop tests and general laboratory vibration work.

Its reduced size enables test engineers or technicians to measure accelerations on lightweight structures simultaneously on three orthogonal axes of vibration.

Two models are available offering 50g and 500g ranges. Specifications include 100 or 10 mV/g output respectively with high resolution (milli-g). Typical frequency response for both models is 1 to 6000 Hz ±5% amplitude, 0.5 to 10,000Hz ±ldB. Resonance frequency is 34,000Hz and operating temperature range is -55 to +125 °C.

Further information: Sharon Stewart, Brüel & Kjær, Tel: 01438 739000; Fax: 01438 739099. e-mail: info@bkgb.co.uk Web site: http://www.bksv.com

Brüel & Kjær is a Key Sponsor of the Institute

from AcSoft

Four-plus channel capability for sound and vibration analysis

In response to increasing market demand for signal acquisition and analysis in four channels, **AcSoft** is now offering a step up from 01dB's successful *Symphonie* dual-channel real-time acoustic and vibration measurement system.

The new *Harmonie* system not only provides four measurement channels, but also four process data channels and a tacho input, increasing its range of applications for acquisition and analysis.

Allowing direct connection of any type of condenser microphone or ICP transducer, and with the choice of 01dB's comprehensive dBFA32 range of frequency analysis software modules, *Harmonie* provides dedicated facilities for a wide variety of applications in the automotive and rotating machinery sectors.

The compact acquisition module weighs no more than a sound level meter, and because it is powered from the host notebook, does not require batteries. Compatibility with common office software packages makes report generation fast and simple.

Fully digital and with two DSPs onboard, *Harmonie* offers IEC1260 class 0 and IEC804-651 type 1 accuracy. As it is three instruments in one, digital signal recording, overall level time history, and third-octave analysis in four channels with 20kHz bandwidth can be achieved simultaneously.

With the basic dBFA32 software package, the system becomes a real-time narrow-band and nth-octave analyser with noise generation capability.

Further information from: John Shelton, AcSoft Ltd, Tel: 01296 682686; Fax: 01296 682860.

from IAC

Acoustic louvres information pack

A new literature pack from **IAC** contains detailed information about its *Noishield* and *Slimshield* acoustic louvres. Aimed at both specifiers and contractors, the pack details design essentials such as louvre

styles, sizes, sound attenuation, finishes and installation.

Two technical data sheets provide laboratory-certified performance data and detailed product specifications, together with several case histories examining specific projects.

Contact: Mike Jackson, sales manager, Building Services Division, IAC, Tel: 01962 873011; Fax: 01962 873123 e-mail: mikej@iacl.co.uk

IAC has also issued a new guide to modular broadcasting, audio and post-production studios. It details almost twenty projects completed for European TV, radio, post-production and sound recording organisations. They range from large TV production and radio talk studios to small voice-over booths and acoustic doors.

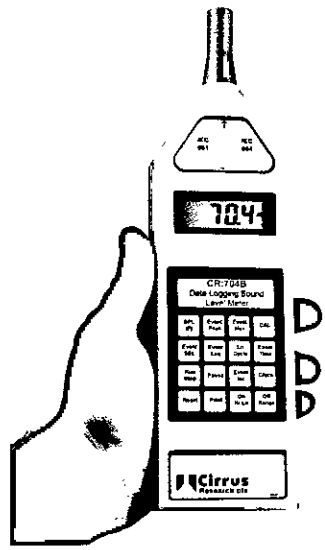
IAC's 'modular' concept of studio building is detailed, explaining why these have become popular with major broadcasters. Fast, clean installation is one major advantage, together with guaranteed, predetermined acoustic performance and the facility to dismantle and re-locate complete studios, easily and at relatively low cost.

Contact: Ian Rich, manager, Studio Division, IAC, Tel: 01962 873025; Fax: 01962 873123 e-mail: ianrich@iacl.co.uk

from Cirrus Research

Sound level meters

The new *CR:704B Sound Level Meter* from **Cirrus Research** has been designed to render routine noise surveys simple and easy. The instrument has been programmed to provide the functions needed for Noise at Work measurements, including L_{eq} and Peak parameters, as well as others often required for industrial noise measurements.



The twin ranges and data logging allow the instrument to be used for both industrial and environmental noise applications, with the standard configuration providing the most common measurement parameters. The meter can store up to 256 measurements and up to 25000 time history elements.

The instrument complies with BS EN60651 and BS EN60804, meeting the requirements of Type 2, making it suitable for most measurement situations.

The *CR:704B* can also be supplied as a complete measurement kit, with all the accessories needed to carry out noise surveys. In addition, accessories are available to form an outdoor measurement system.

The *CR:303 Sound Level Meter* is an ideal tool for checking noise levels and carrying out simple noise surveys. Simple and easy to use, the instrument has only two controls, a maximum hold and the range switch.

The large digital display reads the sound level in dB(A), and the maximum hold function allows noise levels to be measured where the display may not be visible.

Situations where the CR:303 can be used include checking machinery noise levels, the noise output of fire alarms and warning sounds, as well measurements as part of an ongoing Noise at Work survey.

Further details from: James Tingay, Tel: 01723 891655; Fax 01723 891742; www.cirrusresearch.co.uk

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From Hansard

Extracts provided by Rupert Taylor FIOA

18 December 2000
Aircraft noise limits

Fiona Mactaggart: *To ask the Secretary of State for the Environment, Transport and the Regions if he has reached a decision on the outcome of the 1997 to 1999 consultation on his proposals to reduce the noise limits for aircraft departing from Heathrow, Gatwick and Stansted and to improve monitoring of efficiency; and if he will make a statement.*

Mr Mullin: On 24 November 1997 the Department of the Environment, Transport and the Regions published a new consultation paper proposing lower noise limits and improved monitoring arrangements. This followed a Court Order made after challenges by the International Air Transport Association (IATA) to the 1996 decision.

The Order, made with consent of the parties, enabled interim arrangements to be put in place until the outcome of the new consultation. The November 1997 paper was also challenged by IATA but the association withdrew its application for leave to apply for judicial review when the Department undertook to publish a supplementary consultation paper. That was done on 26 March 1999. All the proposals were unchanged. They were:

a) to relate the noise limits to a fixed reference distance, 6.5km from start of roll;

b) to continue to monitor noise levels at the fixed monitors in L_{max} dBA and to apply the noise limits to all departing aircraft except Concorde and a number of specified exemptions (see **(h)**);

c) to reduce the noise limits by 3dBA (daytime) and 2dBA (night-time), to 94dBA and 87dBA respectively;

d) to retain the five monitors at Gatwick and eight monitors at Stansted currently operating under the interim arrangement, but to resite a Stansted monitor to a better position. At Heathrow to keep the eight sites in the interim arrangements and to add two further monitors as previously proposed;

e) to calculate the positional adjustments on a revised basis;

f) to allow a reduction of not more than 2dB of the noise recorded in specified tail wind conditions;

g) to require aircraft to be at a height of 1000 ft aal at 6.5km from start of roll;

h) to exempt from the new daytime noise limits certain aircraft given exemptions from the Chapter 2 phase out requirements in accordance with the provisions of the EC Directive;

i) to begin a further review of both monitoring efficiency and noise limits in 2000.

Comments were invited on any aspect of the proposals and on the details covered in the supplementary paper. Taking account of the information and comments we received, we have decided to implement the proposals, with two modifications:

a) to reduce the night-time noise limit by 2dB, to 87dBA as proposed, but to apply it only during the night quota period (2330-0600), retaining the present night-time limit (89dBA) for the rest of the night period, 2300-2330 and 0600-0700;

b) to implement the new daytime noise limit of 94dBA from 25 February 2001 but to implement the new night-time noise limit from the start of the next summer night restrictions season (ie from 25 March 2001), rather than between 2-3 months from the date of the decision announcement, as indicated in the consultation paper.

Also, for technical reasons, for the purpose of the tailwind allowance I have decided to use wind data from an alternative source to that described in the consultation paper. I am satisfied that it is appropriate to use data from the on-airfield anemometers and wind vanes in the formula for the tailwind allowance proposed in the consultation paper (ie. without making it necessary to adjust the formula).

The reduction of 3dB in the daytime limit represents a halving of noise energy but only a small reduction in loudness. This is a long accepted scientific fact; it is not disputed in the responses.

The cumulative effect of even small improvements should be of benefit to many local residents, particularly those living under the departure routes from about 6.5km from start of roll out to about 15km. These small improvements will occur whenever an aircraft flies overhead that has changed its procedures (or adopted other measures) to meet the new noise limits.

Some major airlines consider they will incur disproportionate costs to achieve these small benefits; conversely, many of the local authorities and other groups representing those living around the airports consider there should be greater noise reductions, to give greater benefits.

I am satisfied that the requirements announced today are reasonable, having regard to what is operationally achievable (as explained in the consultation paper), to the costs that may be incurred by some airlines, the benefits that will accrue to many local residents, as I have already indicated, and the disbenefits that will be caused to others, particularly the far smaller number of people living very close to the end of a runway.

30 January 2001
Noise Act

Mr Gordon Prentice: *To ask the Secretary of State for the Home department how many successful a) private and b) local authority prosecutions have been brought under the Noise Act 1996 in each year since its enactment.*

Mr Charles Clarke: Limited information, taken from the Home Office Court Proceedings Database showing the number of prosecutions and convictions under the Noise Act 1996, is given in the table.

Number of defendants prosecuted for offences under the Noise Act 1996 by type of proceedings and result, 1997-99

	Summons by police	Summons other than by police	Total
1997			
Prosecuted	1	4	2
Convicted	-	2	2
1998			
Prosecuted	-	2	2
Convicted	-	2	2
1999			
Prosecuted	-	2	2
Convicted	-	1	1

Limited data and information are held centrally on the Home Office's Court Proceedings Database for summary offences. For these offences, it is not possible to identify further who issued the summons.

22 January 2001
Aircraft noise

Mrs May: *To ask the Secretary of State for the Environment, Transport and the Regions 1) what research his Department has undertaken into the impact on individuals of loss of sleep due to aircraft noise in the vicinity of Heathrow; and if he will place a copy of the results in the Library; 2) what assessment his Department has made of the effect of the noise from aircraft approaching Heathrow to land between 11.30pm and 6am on residents in a) London and b) Berkshire.*

Mr Mullin: The former Department of Transport published, in December 1992, the *'Report of a Field Study of Aircraft Noise and Sleep Disturbance'*. This study, which was conducted by a consortium led by the CAA's Department of Safety, Environment and Engineering (now the Environment Research and Consultancy Department), was and remains to date the largest survey of its kind in the UK. The survey sites were near Heathrow (Hounslow and Stanwell Moor), Gatwick, Manchester and Stansted airports. Sleep disturbances were detected using actimetry, the validity of which was corroborated using electro-encephalography (EEG).

It was found that noise events below 90dBA SEL (equivalent to about 80dBA L_{max}) were unlikely to affect average sleep disturbance rates, while events noisier than this gave a mean probability of disturbance of about 1 in 75, with a range of individual sensitivities around this average.

Based upon these results, illustrative estimates of disturbances due to aircraft noise events between 11.30pm and 6.00am were included at paragraphs 1.37-1.39 of the Department's Second Stage Consultation on the night restrictions at Heathrow, Gatwick and Stansted, dated November 1998. These broad estimates, and the assumptions on which they rely, are carefully explained in the consultation document.

A limitation of the 1992 study, recognised at the time, was that it was unable thoroughly to examine disturbance at the onset of sleep and at final awakening. Also, the results provided no evidence to suggest that aircraft noise is likely to cause harmful after effects but the study could not explore this issue exhaustively.

In 1998 we announced that we would commission a trial study of sleep disturbance to help inform a decision whether to proceed with a full scale study which would examine, 'inter alia', the question of sleep loss and possible after-effects. In the light of advice from a steering group and technical group established to advise on this work, we also commissioned a social survey of attitudes towards aircraft noise at night. These studies have been conducted by consortiums led respectively by Dr Ian Flindell of the Institute of Sound and Vibration Research and Prof Ian Diamond of the Department of Social Statistics, both at the University of Southampton. They will be published shortly and I shall ensure that copies are placed in the House Library.

Mrs May: *To ask the Secretary of State for the Environment, Transport and the Regions what research his Department has undertaken into the economic benefits of night flights landing at Heathrow during the period from 11.30 pm. to 6 am.*

Mr Mullin: The current night flying restrictions applying at Heathrow (and Gatwick and Stansted) were announced on 10 June 1999, Official Report, columns 378-80W, following extensive consultation. They came into effect on 31 October 1999. Consultation papers were issued on 27 February 1998 and on 17 November 1998. Copies of both were placed in the House Library. As stated in the second consultation paper, the Government has not attempted to quantify the aviation and economic benefits of night flights in monetary terms or to draw up a balance-sheet including the environmental disbenefits.

The Government went on to explain, in paragraphs 1.48-1.57 of the paper, the advice given on this subject in a report submitted by the British Air Transport Association (BATA) in response to the first consultation, and the Government's own approach to the subject. The decision announced on 10 June 1999 reflected the reasoning set out in the second consultation paper and the responses to it.

Mrs May: *To ask the Secretary of State for the Environment, Transport and the Regions what initiatives his Department will be taking as part of the Government's National Noise Strategy to reduce the impact of night flights by civil aviation on those living in rural areas under flight paths.*

Mr Mullin: The Government intends to consult on a National Ambient Noise Strategy later this year, seeking views on how best to develop more effective and better integrated measures for tackling the impact of ambient noise from all the main sources. While the development of the Strategy is underway, we will continue to pursue policies at national and international level to reduce the impact of aircraft noise.

22 January 2001
Noise nuisance

Mr Gordon Prentice: *To ask the Secretary of State for the Environment, Transport and the Regions what recent guidance he has issued to local authorities concerning the implementation and policing of the legislation on noise nuisance.*

Mr Hill: We have not issued guidance to local authorities on this matter, recently. However, we have issued a consultation paper, following a review of the Noise Act 1996, setting out further options for local authorities to use in tackling noise nuisance. The closing date for comments is 31 March.

Copies of the report and consultation paper are available in the House Library.

News on European Directives

In the declaration of work made by the incoming Swedish Presidency of the European Union, two items may be of interest to members. The first is the adoption of the proposed Directive on the protection of workers exposed to Physical Agents (Vibrations).

This Directive, which includes protection from hand-arm vibration and whole-body vibrations, has been discussed vigorously by member states during the past year or so. It was finalised by the council during the latter stages of the French Presidency a few months ago. Discussion is now taking place at the European Parliament which is due to report back this spring.

The second item is the beginning of work on the presidency text for a Directive on the protection of workers exposed to physical agents (Noise). This will be a major revision of the *1986 European Noise at Work Directive,* which in this country is legislated by the *Noise at Work Regulations 1989.*

Although both Directives are in their early stages at present, Keith Broughton (HSE) hopes to keep members informed of their progress through updates in *Acoustics Bulletin.*

e-mail: keith.broughton@hse.gsi.gov.uk

NOISE-CON 2000 on CD-ROM

The Institute of **Noise Control Engineering of the USA** (INCE/USA) and the **Acoustical Society of America** (ASA) jointly sponsored *NOISE-CON 2000,* the National Conference on Noise Control Engineering, held in Newport Beach, California on *Dec 3-5 2000.*

The proceedings of NOISE-CON 2000 were prepared in CD-ROM format in co-operation with the **American Institute of Physics.** Four additional sets of conference proceedings are also included, giving a total of more than 500 technical papers on all aspects of noise control engineering.

The CD-ROM can be searched by keyword, title of paper, or author. All files are in Portable Document Format (.pdf), and can be read with Adobe Acrobat reader (included).

The additional proceedings included are those from NOISE-CON 96, NOISE-CON 97, and NOISE-CON 98, and the proceedings of the 1998 Sound Quality Symposium (SQS 98).

The contents tables of all previous NOISE-CON proceedings are also included.

There was no NOISE-CON conference in 1999. Instead, INCE/USA organised *Inter-Noise 99* (the international congress and exposition on noise control engineering), and Active 99 (the international symposium on active control of sound and vibration). The proceedings of these meetings are available on a second CD-ROM.

The CD-ROMs may be ordered from Bookmasters International, Distribution Services Division, 30 Amberwood Parkway, Ashland OH 44805, USA (phone +1 800 247 6553, fax +1 419 281 6883, e-mail order@bookmaster.com). Credit card payment is acceptable.

For the INCE proceedings CD-ROM quote CD-NCOO, and for the Inter-Noise and Active CD-ROM quote CD-AI99; the price for either is US$75.

For information on printed proceedings, contact INCE/USA at PO Box 3206 Arlington Branch, Poughkeepsie NY 12603, USA (phone +1 845 462 4006, fax +1 845 463 0201, e-mail hq@ince.org).

BSI NEWS

BS EN Publications

BS EN 60534: Industrial: process valves
BS EN 60534-8-1:2001: Noise considerations - Laboratory measurement of noise generated by aerodynamic flow through control valves. No current standard is superseded ISBN 0 580 36615 4

Drafts for Public Comment

00/565184 DC
BS ISO 15186-3 Acoustics - Measurement of sound insulation in buildings and of building elements using sound intensity - Part 3: Laboratory measurements at low frequencies.

LETTER - Abatement Notices

I enjoyed reading Pete Simpson's and Ray Woolley's excellent consultancy spotlight article *(Acoustics Bulletin Jan/Feb 2001),* 'A structured approach to controlling tonal noise', which reminded us that noise control solutions are not necessarily so obvious.

I couldn't help thinking that in trying to be bomb-proof, the Local Authority had complicated the issue at the outset by specifying such a detailed schedule of works in its Abatement Notice, whereas it is often better to be a bit laid back.

After 20 years experience in Environmental Health, I would recommend that a schedule of works is never included. It is not a statutory requirement, and it would cause embarrassment if the specified work failed to cure the problem. As recounted by Pete and Ray, it is all too easy, without a thorough plant survey and knowledge of its operating requirements, to wrongly identify the noise sources and to propose inappropriate control actions.

Nuisance is a vague thing at the best of times, not defined by a set of legal noise limits, a fact which doesn't help anybody, and I suspect that like many in the business I always succumb to a temptation to look for salvation in published guidelines and standards (try the very interesting new WHO Guidelines For Community Noise). However, it is the sole job of the LA to decide whether a noise is a Statutory Nuisance. If it is, their duty is to issue an Abatement Notice.

On the other hand, it is the duty of the person in control of the noise source to decide what to do about it, taking into consideration all factors, so that the statutory defence of 'best practicable means' may be confidently used in the event of any proceedings.

An Abatement Notice only needs to specify a reasonable time for compliance. Anybody served with a notice is entitled to understand the reasons for it, so an investigation report should accompany the notice. The LA's report should by all means include recommendations for action, but I have found that it is best to keep it to a very broad brush which advises the company to engage a reputable consultant to provide detailed guidance on noise control.

A good consultant would be expected to have engineering expertise not possessed by either the LA or the company, and be able to play a central role as a diplomatic bridge between the two, in building a consensus as to the best course of action. Both sides can then feel that they have done their duty.

Writing a meticulously specified schedule of works into an Abatement Notice does throw everybody onto the defensive, as Pete and Ray found, so it is much better not to do it in the first place.

David Wright MIOA
Borough of Pendle

Peter Barnett MIOA 1944 - 2000
"Joan and all the staff at AMS Acoustics would like to thank everyone for their kind thoughts and messages at their very sad loss. Although we can never replace Peter we will endeavour to continue in his footsteps and build on his strong foundations."

Hire News

Building Acoustics

The B&K 3361 RASTI – Speech Transmission Meter is now available for hire.

The Rapid Speech Transmission Index [RASTI] is a method for measuring speech intelligibility in lecture theatres or public address systems etc. The RASTI technique is documented in BS 6840-16.

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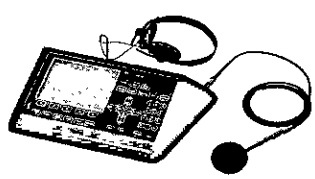

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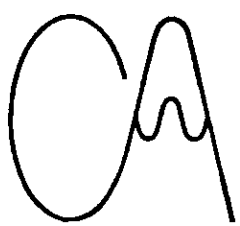

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