NOISE/NEWS INTERNATIONAL

Volume 15, Number 3
2007 September

A quarterly news magazine with an Internet supplement published by I-INCE and INCE/USA

NOISE-CON 08
First Announcement
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Sound Propagation: Review and Tutorial

2006 Global Noise Policy Workshop Part II

MEMBER SOCIETY PROFILE
Spanish Acoustical Society

NEW!
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AF SPL: 38.8
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SETUP
START

NOISE/NEWS INTERNATIONAL

Volume 15, Number 3 2007 September

Features

Departments

Cover Photo:
Shot of lake against horizon with jutting rocks in front. Photo by: Brenda Packer Courtesy of Reno-Tahoe, America's Adventure Place

A quarterly news magazine with an Internet supplement published by I-INCE and INCE/USA

Produced by
Iowa State University College of Engineering
Engineering Communications and Marketing

Noise/News International (ISSN 1021-643X) is a quarterly news magazine published jointly by the International Institute of Noise Control Engineering (I-INCE) and the Institute of Noise Control Engineering of the USA, Inc. (INCE/USA). *Noise/News International* is distributed to the Member Societies of I-INCE and to members of INCE/USA as a member benefit. Advertising sales are handled by Richard J. Peppin. Feature articles for this magazine are selected by the editors. Responsibility for editorial content rests upon the authors, and not upon I-INCE or INCE/USA, the Member Societies of I-INCE, or their members. Product information is published as a service to our readers, and does not constitute an endorsement by the societies or their members. **SUBSCRIPTIONS:** Members and Associates of INCE/USA and the Member Societies of International INCE receive *Noise/News International* as a membership benefit. Other individual or library annual subscriptions are 60 USD in the USA. Subscribers in other counties should add 10 USD per year for first class mailing to Canada and Mexico, and air mail postage overseas. Address inquiries concerning subscriptions to the INCE/USA Business Office, 210 Marston, Iowa State University, Ames, IA 50011-2153. **EDITORIAL CORRESPONDENCE:** Address editorial correspondence to George C. Maling, Jr., 60 High Head Road, Harpswell, ME 04079, USA. Telephone or FAX: +1 207 729 6430; e-mail: maling@alum.mit.edu.

NOISE/NEWS INTERNATIONAL

The printed version of Noise/News International (NNI) and its Internet supplement are published jointly by the International Institute of Noise Control Engineering (I-INCE) and the Institute of Noise Control Engineering of the USA (INCE/USA).

I-INCE

The International Institute of Noise Control Engineering (I-INCE) is a worldwide consortium of societies concerned with noise control and acoustics. I-INCE, chartered in Zürich, Switzerland, is the sponsor of the INTER-NOISE Series of International Congresses on Noise Control Engineering, and, with the Institute of Noise Control Engineering of the USA, publishes this quarterly magazine and its Internet supplement. I-INCE has an active program of technical initiatives, which are described in the Internet supplement to NNI. I-INCE currently has 46 Member Societies in 39 countries.

INCE/USA

The Institute of Noise Control Engineering of the USA (INCE/USA) is a non-profit professional organization incorporated in Washington, D.C., USA. The primary purpose of the Institute is to promote engineering solutions to environmental noise problems. INCE/USA publishes the technical journal, *Noise Control Engineering Journal*, and, with I-INCE publishes this quarterly magazine and its Internet supplement. INCE/USA sponsors the NOISE-CON series of national conferences on noise control engineering and the INTER-NOISE Congress when it is held in North America. INCE/USA Members are professionals in the field of noise control engineering, and many offer consulting services in noise control. Any persons interested in noise control may become an Associate of INCE/USA and receive both this magazine and *Noise Control Engineering Journal.*

NNI Internet Supplement

www.noisenewsinternational.net

- Links to the home pages of I-INCE and INCE/USA
- Abstracts of feature articles in the printed version
- Directory of the Member Societies of I-INCE with links, where available, to the Member Society Profiles and home pages
- Links to I-INCE Technical Initiatives
- Calendar of meetings related to noise—worldwide
- Links, where available, to NNI advertisers
- Links to news related to the development of standards
- Link to an article "Surf the 'Net for News on Noise," which contains links to noise-related sites—worldwide

Noise Regulation and Labeling Systems for Industrial Products

Any noise problem includes three processes: emission, propagation, and reception. Measures need to be taken in each of these processes. Among them, the most essential and effective is to decrease the noise emission. For this purpose, systems for the regulation of noise emissions or noise labeling have become required in environmental noise policies.

In this respect, the European Union (EU) leads the world by legislating noise regulation and a labeling system for various kinds of industrial goods covered by the EU Directives. These systems should be earnestly discussed in other countries. In this column, I would like to briefly introduce the current situation in Japan.

Automobiles: Beginning in 1951, a noise emission regulation system was enacted under the "Noise Regulation Law," in which limit values for noises under acceleration and steady running conditions and exhaust noise are specified for each of four classes of road vehicles. The limit values have been reduced step-by-step.

Airplanes: As in many countries, Japan is also applying the "Airworthiness Certification Procedures" specified in the "Civil Aeronautics Law" and airplanes not in conformity with this specification cannot be operated.

Trains: At present, there is no noise *emission* regulation in Japan. As for the Shinkansen. Super-express train, "Environmental Quality Standards" have been enacted as an effective *immission* regulation and noise mitigation measures are strongly taken.

Machinery for construction works: The "Noise Regulation Law" specifies typical noisy machines used in construction works and obliges constructors to give notification of the usage of these machines. The law also specifies the noise limit at the site boundary. The Ministry of Land, Infrastructure and Transport is promoting a system to designate "low-noise type machine" for typical construction machines. In construction work for national and public projects, only machines complying the specified limits can be used—whereas there is no such a limitation for private enterprises.

Machinery used in factories: The "Noise Regulation Law" specifies typical noisy machines used in general factories and obliges industries to give notification of the usage of these machines. In this procedure, there is no system of noise emission regulation or labeling. To complement this system, the limit of noise level at the site-boundaries is specified in the law. Such machines as boilers, refrigeration equipment, and cooling-towers are regulated in ordinances by local authorities.

General consumer products: There are nineteen Japanese Industrial Standards (JIS) for various kinds of household appliances and the measurement methods of noise emission are specified for each appliance. If the measurement results meet the standard, manufacturers manufacturers are allowed to put the JIS-mark (logo) on the products. Although this system is not legally mandatory, it can be considered as a kind of noise labeling with the expectation that market forces will be effective.

As mentioned above, the Japanese "Noise Regulation Law" specifies noise limits for major noise sources and is, to some extent, effective. But it is a problem that machinery/equipment has been becoming more complex and the specifications in the law are becoming out of date.

The noise labeling system for general consumer products in Japan is at the initial stage and still premature. For this type of noise sources, it should be discussed if noise limits (regulations) should be specified legally; rather, it should be left to public judgment by expecting market forces to be effective.

When considering this topic internationally, standardization is needed for the methods for measuring and expressing the noise emission from industrial products. In this respect, the role of ISO is very important and harmonization between international and national standards in each country is also essential. This product noise issue will be discussed in I-INCE TSG 7, and we are very much looking forward to seeing the results of its activities.

Hideki Tachibana

2007 I-INCE President

A Cooperative Approach for Managing Noise

Marion Burgess

Asia-Pacific Editor

Over 500 persons attended the first European Forum on Effective Solutions for Managing Occupational Noise in July in France. With the support of a number of organizations, Jean Tourret, President of INCE Europe, and his team organized an excellent meeting—bringing together representatives from the diverse groups that have an interest in reducing the extent of hearing loss following excessive noise exposures in the workplace.

For the small contingent from the Asia Pacific region, it was particularly interesting to see the effect that the European Directive (2003/10/EC)[1] has had on the development of noise management across the EU countries. This directive on minimum heath and safety requirements for noise exposure provides the basis for the legislation in each country. Thus, all the countries need to implement the two staged approach with the action level and the exposure limit.

Most countries in the Asia Pacific region have some form of occupational noise legislation. The example of the EC directive shows the benefit of having an agreement to the principles across a number of countries—as that fosters a cooperative approach to developing the required solutions. In many cases, the solutions are available and it is mainly the dissemination and adaptation that is required. In other situations, the problem is complex and the cooperative approach can assist to develop the appropriate solution.

The majority of those working in the area of occupational noise have an engineering and technical background, and so their training is to use quantitative information. Thus, measurement provides the basis for assessing the extent of the problem and the development of solutions. Presentations at the forum discussed this aspect and some outlined the development and use of large databases of noise level data for a range of tools, processes, and workplaces. These databases will provide useful information for those outside Europe because they will be accessible from the Internet. Many countries in the Asia Pacific region are importers of equipment and tools and the impetus from the EU for the inclusion of noise level data on specifications will be of assistance in our region. Manufacturers in countries that export machinery and equipment to the EU are impacted by this directive in two ways. First, they have to provide a declaration of the noise emissions of the products, and, second, the demand for low-noise equipment will increase. The demands for low-noise products hopefully will also increase in the Asia-Pacific region.

On the other hand, some of the presentations showed the benefits of a more pragmatic and qualitative approach to noise management. This acknowledges the high cost of detailed measurements and monitoring and proposes that more efforts be placed in risk prevention and control. This approach involves the employers and the workers to cooperatively identify the priority items and to decide on general strategies for noise reduction that they can adopt. This discussion within the workplace provides an education on noise as well as a good basis for effective implementation of noise management solutions. In most workplaces, the specialists will need to be consulted but at least by that stage there is already a good understanding of the goals for the noise management. In both developed and developing countries, this cooperative approach within the workplace, in the first instance, could lead to more effective use of limited funds and a better overall understanding of the goals of noise management.

[1] *Noise Directive 2003/10/EC of the European Parliament and the Council of 6 February 2003 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise). Available online at* http://eur-lex.europa.eu/LexUriServ/site/en/oj/2003/l_042/l_04220030215en00380044.pdf.


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Member Society Profile

Spanish Acoustical Society

Founded in April 1969, the Spanish Acoustical Society (SEA) is a non-profit scientific and technical organization that promotes that the development of the field of acoustics in Spain. The group was formed in response to interest expressed by a large number of professionals who participated in the First International Conference on Noise Control held two years earlier in Spain.

The seven principal objectives of SEA are to:

- promote progress in all aspects of acoustics
- foster research in the field
- cooperate in the development of the musical culture
- monitor and assist in reducing individual and community exposure to noise
- organize conferences on acoustics
- edit a periodic journal, Revista de Acustica
- promote "Total Quality" in acoustical systems and installations

SEA maintains close ties with a number of professional organizations, including the Instiuto de Acustica of the Scientific Research Council of Spain. The Society is a founding member of the European Acoustics Association (EAA), which is united with FASE, of the International Commission on Acoustics (ICA), and of CEAF Comite Espanol de Audiofonologia. It also maintains membership in the Bureau International d'Audiophonologie (BIAP), and the Federacao Iberoamericana de Acustica (FIA), a federation of the acoustical societies of Spanish and Portuguese speaking countries.

SEA has a long tradition of sponsoring educational forums, workshops and seminars. Most recently, the Society co-hosted the 19th International Congress on Acoustics held in Madrid and focused on the general theme of "Acoustics for the 21st Century." In 1994, SEA celebrated the 25th anniversary of its founding by hosting an International Conference on the Acoustic Quality of Concert Halls, also in Madrid. An international conference on "Noise in Urban Areas" was held in 1991 and in 1990, the Society helped the profession address concerns on "Environmental Noise in Urban Areas."

This is the 59th in a series of articles on the Member Societies of International INCE.

SEA organized the 8th FASE Symposium on Environmental Acoustics in Zaragoza in 1989, the 11th FASE Symposium on Acoustical Materials and Ultrasonic Transducers in Valencia in 1984, and in 1977, SEA organized on behalf of the International Commission on Acoustics (ICA) the 9th International Congress on Acoustics in Madrid, with satellite symposia in Barcelona and Seville. The event attracted 1,500 participants from all over the world; some 900 papers were presented.

Every year, SEA organizes a national meeting in different cities in Spain. This conference, which is called "Tecniacustica," promotes the study of acoustics in Spain's universities and provides an annual opportunity for reporting on the latest research developments and technical advances in the field. The conference is usually arranged to cover four areas:

- community noise
- industrial noise and workers' health
- architectural acoustics
- vibration control

The technical committees of SEA cover the following areas of acoustics: ultrasonics, general occupational noise environmental acoustics, architectural acoustics, and measurement and instrumentation.

From its founding, SEA has cooperated with the acoustical societies of other countries, particularly those in Europe and Latin America that use Romance languages. SEA publishes Revista de Acustica, the premier acoustics publication in the Spanish language.

Member Society Profile is a regular feature of the Noise News International. If you would like to have your society featured, please contact George Maling at inceusa@aol.com.

The **Institute of Noise Control Engineering/USA** *has announced that* **Dearborn, Michigan**, *will be the site for Noise-Con 2008. The meeting will be held* **28-30 July** *at the* **Hyatt Regency**; *Teik C. Lim and Jay H. Kim, both of the University of Cincinnati, are serving as the general chair and technical chair, respectively.*

FIRST ANNOUNCEMENT NOISE-CON 08

PROGRAM

Though many of the conference details are still in the planning stages, organizers are expected to incorporate several of the features usually offered at a Noise-Con meeting, including technical sessions on noise and vibration control issues and related topics along with a large vendor exposition. The Expo, managed by Richard Peppin of Scantek, Inc., will offer displays of materials, instruments and services in the noise and vibration control field. An Expo reception and off-site social will also be included. Potential exhibitors are encouraged to contact Peppin for details, including costs and floor plan (PeppinR@AMSE.org)

To facilitate interaction among wide spectrum of noise control professionals, the 30th annual conference of ASME's Noise Control and Acoustics Division (NCAD) will be held in conjunction with Noise-Con 2008. The ASME NCAD conference is expected to contribute 40-60 papers to the joint event; Noise-Con alone usually draws 150-200 papers. "Merged" sessions are also planned so that ASME NCAD and INCE members can jointly present their work. One of the Noise-Con's three plenary lectures will be hosted by ASME NCAD as its annual Rayleigh Lecture series. Steve Hambric, Pennsylvania State University, is the AMSE NCAD organizer.

Immediately following Noise-Con 2008, a **Sound Quality Symposium (SQS)** is planned for **31 July**. Patricia Davies, Purdue University, and Gordon Ebbitt, Carcoustics, will plan this event, which is expected to feature a number of technical papers on topics related to sound quality, including its applications to noise control and product design.

VENUE

The venue for Noise-Con 2008 will be familiar to many attendees: Inter-Noise 2002 was held at this property. This elegant, four-diamond hotel combines all of the amenities of modern city living with a comfortable suburban setting—across from Ford World Headquarters and the Henry Ford Museum, and just minutes from downtown. Enjoy the many advantages of this well designed from extensive business facilities and spacious guestrooms to on-site transportation services and delicious dining options. The hotel has a 24-hour fitness center, indoor pool, whirlpool and sauna. Discounted rates will be available to Noise-Con 2008 participants.

Details on Noise-Con 2008 will be posted on the INCE website (www.inceusa.org) as they become available. Inquiries about the event can be sent to Pam Reinig, Director of the INCE Business Office and Noise-Con 2008 Conference Secretariat, at preinig@iastate.edu.

2006 Global Noise Policy Workshop II

Honolulu, Hawaii
4 December 2006

A fourth Global Noise Policy Workshop was held during INTER-NOISE 2006 in Honolulu, Hawaii, on Monday, December 4. The theme of the workshop was **"Implementation and Enforcement of Noise Control Policies."** William W. Lang and Tjeert ten Wolde were co-chairs of the workshop.

The workshop featured morning and afternoon sessions with presentations by experienced engineers from countries around the world. Summaries of the panel presentations and discussion for the first session of the workshop were published in the June issue of this magazine. This issue contains similar information for the second session.

Panelists spoke on the development, implementation, and enforcement of noise control regulations in their country at local, state, and national levels.

The following presentations were made during the first session of the Global Noise Policy Workshop. A discussion session followed. Summaries of the presentations as well as a summary of the discussion are included in this article, and material from the third session will be featured in the December issue of *NNI*.

Review of Noise Policy in Japan
Rika Tanaka, the Ministry of the Environment of Japan

Noise Policy in Brazil
Samir N. Y. Gerges, Federal University of Santa Catarina, Florianopolis, Brazil

Eco-labels, Acoustical Test Codes, and Quiet Products
Ikuo Kimizuka, IBM Japan

How Standards Can Help Implement Global Noise Control Policies
Paul Schomer, Schomer and Associates, Inc.

Review of Noise Policy in Japan

Rika Tanaka, the Ministry of the Environment of Japan

Introduction

A review of noise policy in Japan will cover the following:

- current laws for environmental noise,
- environmental quality standard (EQS) for noise,
- noise regulation law,
- today's challenge of the noise policy, and
- future prospects.

Current Laws for Environmental Noise

In Japan basic environmental law was established in 1993 which defined the fundamental principle: to reduce environmental noise in Japan. Environmental Quality Standards (EQS) and noise regulation law were also established under this law.

WECPNL and Day-Evening-Night Sound Level are Closely Related

Environmental Quality Standards for Noise

The purpose of the Environmental Quality Standards (EQS) is the protection of human health and the conservation of the living environment. Furthermore, they are the policy target. We have three EQSs for general noise, including road traffic noise, aircraft noise, and high-speed (bullet) train noise. The index of EQS for general noise—L_{50}—was adopted in 1971, and later, in 1998, L_{Aeq} was adopted.

Noise Regulation Law

Noise regulation law was established in 1968. The targets of this law are industrial complexes, construction sites, and motor vehicles. Each noise source has different values and the indexes are also different. The number of noise complaints in Japan has decreased since this law was established, but recently they have been increasing because of the increase in construction work.

Today's Challenge of Noise Policy

The Weighted Equivalent Perceived Noise Level (WECPNL) was adopted as the index of EQS for aircraft noise in 1973. It has never been revised, and recently the validity of this index has been questioned. This questioning is mainly caused by a slight contradiction in evaluating aircraft noise using WECPNL at Narita Airport. So we are investigating the validity of WECPNL and the relationship among WECPNL and the day-evening-night level, L_{den}. As a result of this examination, it was found that a linear relationship exists between WECPNL and L_{den}, and no contradiction may occur as long as we adhere to the energy-sum principle when calculating L_{den}.

Future Prospects

It has been about 30 years since EQS and the noise regulation laws were established. As a result, some problems of environmental noise have been exposed as mentioned previously. We are trying to review the measuring methods, evaluation methods, and regulation methods for each noise source, such as the appropriateness of the system for factories and construction work.

Noise Policy in Brazil

Samir N. Y. Gerges, Federal University of Santa Catarina, Florianopolis, Brazil

Policies and regulations

There are noise policies and regulations in Brazil for occupational, community, and product noise.

1. Noise in the workplace, MTE 3214-1978, is a regulation of the Minister of Labour which specifies 85 dBA – 8 hours shift with 5 dBA exchange rate (this should be changed to 3 dB).
2. Community Noise: There are two regulations of the Minister of the Environment covering noise which affects industrial, commercial, social, recreation, and political activities.
   - Silence regulation NBR10151: SPL= 35-45 dBA between 10 PM to 6 AM (to be adjusted depending on the zip-code area).
   - Comfort regulation NBR10152: Table of SPL (35 to 60 dBA) or NC curves for each place (hospital, hotel, residence, offices, school, etc.) range from NC= 30 to 55.
3. Brazil also has Standard NBR 13910-1, -2, and -3:1999 which recommends noise labeling using the sound power level. This has been in effect since 15 August 2000 and applies now to vacuum cleaners, hairdryers, mixers, and refrigerators; although it is expanding to include other household appliances. At this time the standard is "recommended" but not "required."

Brazil's position regarding noise control

We believe that actions for industrial noise control at the source should be considered as a first priority, but if economically not possible, the use of hearing protection for exposure levels above 85 dBA should be mandatory. The Ministers of Labour and the Environment are responsible for enacting and enforcing the noise control regulations and are considering the following actions to make the public more aware of the need for noise control:

- Offer technical courses for human resources in the government agencies,
- educate the public on the effects of noise on health,
- encourage manufacturers to produce low-noise equipment, and
- support financially the development of new-technologies for quiet products.

Regulation enforcement

Since 2001 the workers' party has been in power in Brazil, and since then industrial noise regulations have been enforced, often with a court case. If industrial noise cannot be reduced at the source, hearing protectors are required. In Brazil, there are over 1,000 brands of hearing protectors available (locally manufactured, exported and imported). All hearing protection devices must go through attenuation measurements in Brazil (ANSI S12.9-2000 [B]) subject fit method, at the UFSC – LARI Laboratory. But in spite of the enforced use of hearing protection, there are a large number of workers with permanent hearing loss due to the difficulties of correct fitting, especially for the plug type.

Situation in South America

Most South America countries have regulations similar to those in Brazil. But in many, enforcement is not as effective as it is in Brazil. The countries with regulations that are being enforced include, in the order of effectiveness, Brazil, Chile, Mexico, Argentina, and Peru.

Industrial Noise Control at the Source Should be Considered as a First Priority

Education in the detrimental effects of excessive noise and the availability of noise control is also very limited in South America. Brazil has been effective in its efforts to increase public awareness; and, to some extent, Chile and Mexico are making limited efforts in education. The IbroAmerican Federation of Acoustics (FIA) in the last years has played an important role in noise control engineering education through its congresses in 1998 (Brazil), 2000 (Spain), 2002 (Cancun with ASA), 2004 (Portugal), and 2006 (Chile).

What can be done to improve the implementation and enforcement of noise regulations in South America and worldwide? We have the following opportunities:

- Education at all levels—primary, secondary, high school, and university,
- offering low-cost congresses and seminars for workers, government bodies, safety technicians and engineers,
- training of government agency personnel,
- distribution of low-cost publications,
- encouragement of manufacturers to produce low-noise equipment,
- funding of research groups developing new technology for a quieter environment, and
- participation in international standardization for noise control.

Through the Member Societies of I-INCE, we can move noise policy from a national level to a global level by developing stronger relationships between these Member Societies and encouraging more effective participation in the activities of I-INCE. I-INCE could support activities to reach the public in developing countries in their local language the message that hearing health is a basic necessity. I-INCE could also support education in basic noise control concepts and techniques in these developing countries.

Future Actions

I-INCE could encourage organizing congresses, workshops, or seminars in the developing countries. An excellent example is INTER-NOISE 2005 which gave a good boost to Brazil and South America in noise control engineering advances. In addition, the registration fees for attendees in these developing countries should be about 50 percent of full fees. This reduction in fees enabled many South American engineers to participate without serious financial strains.

The Member Societies of I-INCE can support the publication in local languages of basic noise control techniques. Also, publications such as *Noise Control Engineering Journal, Noise/News International*, and publications of other professional societies involved in the reduction of noise worldwide might be offered at reduced fees to individuals who are members of the I-INCE Member Societies.

Eco-labels, Acoustical Test Codes, and Quiet Products

Ikuo Kimizuka, IBM Japan

There are no obligatory noise-level requirements for information technology (IT) equipment. However, there are available eco-labeling systems and recommended acoustical test codes for this equipment. Both the test codes and eco-labels provide manufacturers with the opportunity for a "level playing field" for their products. The IT equipment which these affect in terms of noise includes personal computers, printers, copiers, servers, and mainframe devices.

Eco-labels

There are many eco-labels in Europe; among them are the Nordic Swan, the Blue Angel Mark, the EcoMark, and the EU eco-label (eco-flower). Non-European eco-labels include:

- Korea: Eco-labelling Program
- Taiwan: Green Mark
- China: China Certification Committee for Environmental Labeling (CCEL)
- Singapore: Green label
- Japan: Eco-mark

Acoustical Test Codes

Acoustical test codes are a set of standards dedicated to the measurement, declaration, and verification of the noise emissions of specific categories of equipment. Some acoustical test codes for IT equipment may be found in the following:

- Statskontoret 26:6 (Sweden)
- European Telecommunications Institute (ETSI) 300 753
- ISO 7779 for measurement
- ISO 9296 for declaration

Key noise limit parameters in the test codes must be shown as the declared, A-weighted sound power level, L_{WAd}. The chart below shows some available test codes.

INTERNATIONAL	INDUSTRY	JAPAN
ISO 7779	ECMA-74	JIS X 7779
ISO 9295	ECMA-108	JIS X 7779 Annexes F, G
ISO 9296	ECMA-109	JIS X 7778

Each set of test codes works well. If there is no measurement, there is no control!

Summary

- There is no regulatory obligation for IT equipment noise emissions.
- The key noise emission parameters are the declared A-weighted sound power level L_{WAd}, supplemented by A-weighted emission sound pressure level L_{pAm}.
- Test codes by ECMA/ISO/JIS work well.
- Noise test codes and eco-labels make a level playing field!
- A noise level playing field is one way to encourage noise control policy, especially in market-based situations.
- There is a need to regularly update the noise test codes.
- There is also a need to investigate the possibility of new and/or additional noise control parameters (sound quality).

How Standards Can Help Implement Global Noise Control Policies

Paul Schomer, Schomer and Associates, Inc.

There is no question that International Standards (i.e., International Organization for Standardization (ISO) and International Electro-technical Commission (IEC)) are required for implementation of global noise control policies. They are a requirement for source emissions measurements, sound propagation modeling, receiver immission measurements, and receiver noise rating. Thus standards are more than an aid to implementing global noise control policies; they are essential.

But standards are a two-edged sword. Standards, while essential to global noise control policies, also inhibit improvements in implementation and enforcement of global noise control policies. For example, A-weighting has been in use for about 75 years. It facilitated the USA Environmental Protection Agency national noise policy in 1974, it has been adopted in the EU for their noise mapping program, it is used in ISO 1996, and it is used in many local and regional regulations. But, as demonstrated by ISO 1996, the use of A-weighting requires many ad hoc corrections, especially when multiple different types of sound sources are involved. Possibly better metrics cannot get evaluated and/or implemented in large part because of the extensive historical and current use of A-weighting in standards.

Sound level meters (SLMs) are a second example. The International Standardization of the SLM allows for the international comparability of measurements and facilitates international trade. But the SLM features include the minimum composite set that achieves consensus, and the measurement uncertainty is the maximum that obtains consensus.

Noise source operating requirements during standardized measurements are another example. Automobile emissions were measured in accordance with applicable standards under maximum noise conditions, and internationally these source emissions were reduced. But the sound levels in communities that resulted from automobile emissions did not decline. The maximum noise level was the wrong operational quantity to be measuring. It simply did not correlate well with normal, in-use automobile noise emissions.

Thus standards, to be truly effective, must be more open to new ideas (e.g., a new metric), must push the state of the art—at least to some extent (e.g., measurement uncertainty), and, clearly, the source operating conditions required during emissions measurements must lead to corresponding reductions in source immissions.

In addition to the technical content issues described above that relate to the use of International Standards for the fostering of global noise policies and the movement from national to international policies, there are non-technical issues related to implementation and use of International Standards. For example, national pride, protectionist policies, or bureaucratic stubbornness each can inhibit the adoption and use of International Standards. Consider the large number of metrics for assessing aircraft or motor vehicle noise that formerly, and to some extent still, exist in Europe. Surely national pride plays a role in the creation of such a situation.

Discussion

Following the four presentations, a discussion was held. Below is a summary of the discussion. This includes questions (Q) from the attendees, answers (A) of the panelists, and comments (C) from both attendees and panelists. Bill Lang chaired the discussion. The discussion has been arranged by topic, and is not in the order in which the actual discussion took place.

Panelists: Rika Tanaka, Japan
Samir Gerges, Brazil
Paul Schomer, U.S.A.
Ikuo Kimizuka, Japan

Standards, to be Truly Effective, Must be Open to New Ideas

Metrics for Community Noise

Q: Paul Schomer, can you suggest any path to move away from A-weighting?

A: Perhaps an I-INCE technical study group is a start.

C: (Dan Kato) Would the next logical step just be going to loudness?

C: (Paul Schomer) I think that the next logical step is something that better approximates how we hear. It could be loudness, but it could be other metrics that are useful indoors. It's strange to me that we measure A-weighted levels outdoors the noise that people hear indoors.

FAA's Role

Q: Paul Schomer, is the Federal Aviation Administration of the U.S. a help or a hindrance in the search for global (international) standards and noise criteria?

A: They are very much a hindrance. In the latest round of noise reductions for the Stage 3 aircraft, my understanding is that most major aircraft manufacturers report they can meet the requirement which entails minor modifications to a few existing aircraft. The FAA approved X plus delta so the result was that the manufacturers had to do nothing.

Q: Paul Schomer, what steps are next needed to assist the FAA in becoming more responsive and responsible?

A: The fundamental problem is that the advocate of aviation in each country cannot also be the environmental regulator. It's like having the fox watching the hen house. It can't possibly work. The result has been that it's almost impossible to build new airports worldwide because the public recognizes that this is a problem, but the airport community believes it's not a problem. Therefore, capacity at airports is being strained to the limits; new airports can't be built because the regulatory policy is broken.

Standardization's Role

Q: Paul Schomer, you have clearly indicated the shortcomings of standardization to serve global harmonization of the various elements of noise control. I think that we cannot overcome these obstacles and that we should limit our ambitions to the most important items. In my opinion these are 1) type-test methods for products and 2) immission quantities. What do you think?

A: Whenever we have somebody new in standards, we tell them not to set their scope too broad. The smaller the piece we try to chew on at one time, the more likely we will succeed. Certainly in standards that's the case.

Traffic Noise Regulation in Brazil

Q: Samir Gerges, what types of prediction models or methods are used to evaluate traffic (cars, trucks, buses) noise in Brazil?

A: In Brazil the Ministry of the Environment has had a regulation for traffic noise since 1990. They adopted a long-term plan for maximum noise level limits of vehicles, both moving (bypass) and standing still, measured according to ISO standards. Our goal was that by the end of 2006, all new cars, trucks, and buses must satisfy the limits. The manufacturers must guarantee that all new vehicles produced are within these limits. Such measurements are being performed in different states and cities.

Q: Samir Gerges, has Brazil used any of the U. S. traffic noise prediction models such as TNM Version 2.5 to calculate future noise levels which could be used to provide noise abatement?

A: No.

Global Eco-Labels

Q: Ikuo Kimizuka, do you see any possibility for a global eco-label?

A: Yes. The potential for a global eco-label network exists.

Complaints About Noise

Q: Rika Tanaka, you have shown plots about the number of complaints in Japan. How were they determined?

A: Every year the central government tabulates calls and complaints about noise issues reported to the local governments.

Q: Rika Tanaka, was the way in which they were determined constant over the years?

A: Yes.

C: (Tjeert ten Wolde) The number of complaints is a very tricky quantity, and is very much determined by local circumstances. You mentioned the step from the local government to the central government, but the vital step is the step from the citizens to the local authorities. If the local authorities change the way in which they collect complaints, the final data cannot be compared. This is why I do not like to use complaints as a quantity for the evaluation of a noise situation.

Regulations, Standards, and Guidelines in Japan and Elsewhere

Q: Rika Tanaka, this is about Japanese Environmental Quality Standards (EQS) on traffic noise. Please tell us if the standards are statutory for all types of roads. If the standards cannot be met, particularly the nighttime standards, what are the consequences?

A: The EQS is just a guideline, so nothing much is done. But we have other noise regulations which require sound levels below certain limits, and you have to do something about this noise. The government or local authorities can't avoid taking action to enforce these levels.

C: (Larry Finegold) There are several parts to the environmental quality standards for road traffic in Japan. First, this is not determined by the type of road; there's just one standard for all roads. Second, there is no separate nighttime standard. Third, there is a difference between a regulation and a guideline. The numbers in the environmental quality standard are only guidelines. However, there is a parallel linked policy on environmental impact assessment where they take the same information from the environmental quality standard and make it regulatory in the environmental impact assessment regulation. So there is a distinction between regulation and guideline—sometimes the same number is considered a guideline, sometimes it is considered a regulation.

The Number of Complaints is a Very Tricky Quantity, and is Very Much Determined by Local Circumstances

C: (Dieter Schwela) Guidelines are not standards, because standards are promulgated with enforceable noise levels. So the question is: Are your guidelines promulgated or are they just recommendations which cannot be enforced?

A: (colleague of Rika) The standards were established 30 years ago, and at that time the meaning was different. Now we use the word standard, but it means guideline—desirable guideline but not mandatory.

C: (Bill Lang) So you're saying there is no enforcement or penalty for non-compliance because there is nothing to be complied with; it's only a guideline. Is that correct?

C: (colleague of Rika) If the guideline is used for impact assessment, you have to do something to reduce noise until you meet that guideline. But for other purposes if the noise is above the guideline, nobody need do anything about it.

C: (Larry Finegold) The environmental quality standards were developed in the 1970s when a standard was simply a guideline. But in environmental impact assessment, that same number now falls under a different government policy document which is regulatory.

Q: (Bill Lang) What is the penalty for non-compliance?

A: (Larry Finegold) Enforcement, compliance, and mitigation are more flexible than in Western countries. Mitigation is required in order to reduce the exposure to the required level.

C: (Dieter Schwela) A standard is a value which is promulgated where you have a penalty if the standard is not complied with.

C: (Larry Finegold) ISO and U.S. ANSI standards are not regulatory; compliance is not required. For the most part standards are voluntary. They are, in fact, guidelines.

C: (Maurice Yeung) In Hong Kong we have a limit, probably from the mid-80s, for road traffic noise. If this limit is used for impact assessment, it becomes a standard so that there is a requirement for the noise sources to meet the standard.

C: (Tjeert ten Wolde) This is completely opposite from what it is in my country. There are firm limits within the legislation, but we don't call these standards. Standards are recommendations which legislation may adopt and make them requirements. In the environmental impact assessment in my country, and I think in the whole of Europe, there are no set standards. It is a very flexible approach.

C: (Larry Finegold) This discussion of terminology is well suited for this session today. Yesterday Hideki Tachibana, who is the convener of I-INCE TSG 3 where we are compiling a database of international noise policies, discussed this same issue at length. We will produce a database in hard copy form and in a spreadsheet form on the I-INCE website in the near future. We are thinking about doing away with this whole nomenclature of regulation, guideline, standard, whatever terminology you want to use, and going to a very simple scheme recommended by Dr. Schomer. To avoid confusion, have just two categories—a policy is either required or recommended. That gets rid of the confusion, even though it does not resolve the issue in some countries like Hong Kong and Japan who use the same number, sometimes as a guideline, sometimes as a regulation.

C: (Dieter Schwela) In Germany people consider a standard an enforceable value; and if one does not comply with the standard, there is a penalty. It is mandatory. Even in the environmental impact assessment it is not considered a recommendation. The immission standards in Germany are standards with enforceable values. If you don't comply with them, then you have to pay for it.

C: (Hee Joon Eun) There is a problem. In Korea the use of the word standard is flexible. If it is not exactly a standard but there is no other proper word, we use standard.

C: (speaker from Japan) The Japanese environmental quality standards were established by the Ministry of the Environment as guidelines for attaining desirable living conditions by the airports. The reason for establishing the environmental quality standards was to have a desired goal which national governments and local authorities could strive to meet.

C: (Truls Gjestland) As Dieter Schwela said, there is a misunderstanding of the word standard. If you're talking about ISO, those are methods for how to measure something, how to go about coming up with numbers. Then you have limits that are imposed by local or national governments, but the limits are very seldom mentioned in the standards. Standards are methods; that's the difference. In Deutsche Industrinormen (DIN) in Germany you don't give the limits, you give the method, but some authorities then say that, according to this standard, the limit is determined.

A Common Misunderstanding is that the European Community Directive on Environmental Noise Includes Limits. It Doesn't.

C: (Bill Lang) The U. S. government regulatory agencies use the word "standard" to mean a regulatory requirement.

C: (Paul Schomer) I think that "standard" is one word we cannot use in the documents we write and have it understood because it means something different in every country. It doesn't make anybody right or wrong, that's just the way it is. We had a similar problem in ISO 1996, Part 1, with the words "background" and "ambient." Because background and ambient meant exactly the opposite in two different countries, it was impossible to use those words; and we used "residual." We cannot use the word "standard" and communicate.

Q: (Bill Lang) How does the audience feel if we were to adopt your proposal, Dr. Schomer, to use only two words—requirement and recommendation? Would that avoid this linguistic hassle?

C: (Kjell Spång) No. Truls was right about international standards, European standards, and others—they do not have limits in them but are mainly methods for measurement and assessment. Another common misunderstanding is that the European Community directive on environmental noise includes limits. It doesn't. It tells you what to measure and how to do noise mapping. The limits are set by the nations. We use only the words "recommendation" or "requirement." The European standards (CEN, CENELEC) can be harmonized in relation to a specific EEC directive. If you apply this standard you have fulfilled the requirements of the specific directive. Then the standards can be more than recommendations. The word standard has been used since the beginning of the 20th century in ISO, in IEC, and now also in CEN and CENELEC and in national standards. I don't think we can avoid that word.

C: (David Lubman) With respect to what Kjell said about using just two words--recommendation and requirement. What if we add a third word, "method," would that solve the problem?

C: (Paul Schomer) I think what you're dealing with in Technical Study Group 3 is really the limit values and whether those limit values are required or recommended. In the United States the FAA has a limit value that they like to make people think is some standard of 65 dB. It's a limit value and the question is: Is it required or is it just recommended? Our EPA had a limit value of 55 dB which was clearly a recommendation and not a requirement. But in the state of Illinois, we have octave-band limit values for one hour L_{eq} that are limit values and not recommendations. So these numbers can either be limit values, they can be goals, they can be recommendations. I think the confusion is that the word standard comes in there, but it's a standard as to what the number is but doesn't in any way mean the same thing as standard in the terms of ISO or IEC. It's the same word with two vastly different meanings. Then to make it worse, in some countries apparently, even if it's a limit value, the word "standard" means something different from one country to another country. So again I say that for what we're doing let's not use "standard" but rather the limit values, and are these limit values requirements or recommendations.

We Should Distinguish Between the Scientific Work in Which Most of the People Here are Involved and the Political Side of the Problem

C: (Pierre Deshaies) We should distinguish between the scientific work in which I think most of the people here are involved and the political side of the problem. In scientific terms I think that required measurement methods stick to the word "standard," and these are ways to measure things. When we set up limit values for different noise sources or contexts, then these are recommended limits; these are guidelines from a scientific point of view. When these recommended guidelines are adopted into legislation by political process, then it is out of the field of scientific work. I would stick to the idea of two basic terms and just explain that methodological requirements are developed by standardization organizations because I think we can't get rid of the term.

Metrics: Indoor and Outdoor Noise Levels

Q: (Bill Lang) I would like to pursue the subject indirectly with a general question related to the problem of metrics. Not only do we have a problem with terminology which we just discussed at great length, but we also have the problem of metrics which Dr. Schomer has mentioned earlier. Paul Schomer, metrics and terminology go hand in hand. Is there some way that this could be put together?

A: Things can always be put together; but whether it's a good idea or not or is logical to put them together is the issue.

C: (Paul Schomer) We measure A-weighted indoors for source measurements of equipment that is being used indoors. It's the A-weighted sound, and the listener hears the A-weighted sound. For environmental noise we measure the A-weighted sound outdoors for a listener indoors. The difference between the two is the low-pass filter of the house. So you've got something vastly different that the receiver is hearing depending upon whether it's environmental sound or machinery sound with the same annoyance potential. One or the other has to be wrong because you're doing two different things for the same purpose.

Q: Is the presence of the house causing an artifact to be introduced into the measurement?

A: (Paul Schomer) Yes, it has a substantial low-pass filter effect.

C: (Bob Bruce) In Houston we've had an A-weighted sound level requirement outdoors, and we have a number of residential areas that are near restaurants and bars. So you can be in compliance with the A-weighted sound level outdoors and still be driving the people inside crazy because of the low basses coming through. We've often thought that a combination of the C- and A-limits might be an easier and more appropriate thing to enforce.

C: (George Maling) One might also consider the case where you do something about the indoor environment. For example, in the FAA set-up—the residential sound insulation program—you may measure the A-weighted level inside the house in the beginning; and the treatment may result in a different frequency response. So if you end up measuring insertion loss in terms of A-weighted levels, you may get a misleading reading.

C: (Tjeert ten Wolde) The type testing methods are emission test methods and are A-weighted. But in many prediction methods for outdoor or indoor noise, one-third octave band spectra are used as input and for the transmission spectra, so you have a final spectra in one-third octave bands. But this method within buildings results in a situation that appears to be better than it actually is. The weak point is in the simplicity of the test methods.

C: (Larry Finegold) Absolutely correct. Why does this difference exist? Why are we measuring outside and then predicting response inside? Because this the way it has been done for 45 years and the challenges of doing the noise exposure measurement for each person inside the house, and for each room, is an impossible challenge. Therefore, for 45 years we have relied on the outdoor/indoor transfer function which depends on whether you're in a cold or a warm climate and on the season of the year (windows open, partially closed, or fully closed). We've solved the problem to some extent by considering sleep disturbance as opposed to annoyance. In-bedroom noise measurements to study sleep disturbance have been pretty much standardized internationally. But we've just begun to study total noise exposure for other effects. Until you have a portable noise monitor for human response studies in the community similar to the occupational noise dosimeter, you can't solve the problem.

C: (Volker Irmer) In Germany we had the same problem, and we have taken small steps to solve it. In predicting indoor noise levels from outdoor noise levels, we add some correction factors that are due to the noise source. For instance, if there is a train we add 5 dBs, if there is a road we add 2 dBs or something like this. That is very easy but perhaps not a good way to handle this, but it is the first step.

C: (Truls Gjestland) You say that we should measure inside because people are inside, but they are also outside. Some studies use a 60 percent figure inside and 40 percent outside the home in the assessment. So when you ask people at home, they are not necessarily inside their home. They could be out on the balcony or in the street in the neighborhood. So the outdoor noise is also quite important.

C: (Comment from Japan) Japanese quality standards are primarily specified for indoors—speech interference and sleep disturbance are considered. Because the source of the noise is outdoors you must specify outdoor values. If you measure indoor noise while you sleep, you get the level in a specific residence which may be different from that in another residence. So it is impossible to specify inside noise levels. Therefore, the government decided to specify outside values taking into consideration the transmission loss of houses.

Sound propagation: Review and tutorial

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Introduction

The reality of sound propagation in the atmosphere is more complicated than simple geometrical spreading above a flat hard ground. Most common grounds, such as grass covered ground and layers of snow, are acoustically soft. This implies a complex reflection coefficient leading to a measured spectrum that is strongly influenced by the type of ground surface between source and receiver. Grounds may not be flat, leading to shadow zones or alternatively multiple reflections at the ground. Gradients of wind and temperature refract sound either upwards (upwind or in a temperature lapse) or downwards (downwind or in a temperature inversion), also leading to shadow zones or multiple reflections, respectively. Atmospheric turbulence causes fluctuations and scatters sound into acoustical shadow zones. Many of these features mutually interact and accurate predictions of sound transmission from source to receiver must somehow account for all of these phenomena simultaneously.

This paper is a brief review and tutorial of sound propagation in the open air. This is followed by a limited comparison of the predictions of ISO 9613 Part 2 [9] with physical or numerical models in a few specific cases.

In recent years, a number of review articles and book chapters have appeared in print and give a detailed summary of sound propagation in the open air. For a detailed review see Embleton and Daigle [1] or Sutherland and Daigle [2]. For a tutorial on outdoor sound propagation see Embleton [3]. For a detailed treatise of computational aspects see Salomon [4]. Articles written for the non-specialist include Daigle [5] and Daigle [6]. The paper by Daigle [7] focuses on the noise control aspects of sound outdoors. Finally, for the practical engineering aspects of predicting sound propagation in the open air see Piercy and Daigle [8].

Brief Review and Tutorial

When sound propagates, it is attenuated and the spectral or temporal characteristics of the sound received at a distance from the source is changed. The attenuation means that sound propagating through the atmosphere decreases in level with increasing distance between source and receiver. The total attenuation, A_T, in decibels, can be expressed as the sum of three independent terms,

$$A_T = A_{div} + A_{abs} + A_{env} \tag{1}$$

where A_{div} is the attenuation due to geometrical spreading, A_{abs} is the attenuation from atmospheric absorption, and A_{env} represents all other attenuation.

In the case of a point source, the attenuation due to geometrical spreading (A_{div}) is proportional to the inverse of the distance between source and receiver. This implies a 6 dB decrease in sound pressure level per doubling of distance and it is the same for all acoustic frequencies. In contrast, the attenuation due to the other two terms in Eq. (1) depends on frequency and therefore changes the spectral characteristics of the sound.

Dissipation of acoustic energy in the atmosphere is caused by viscosity, thermal conduction, and molecular relaxation. The resulting attenuation is strongly dependent on temperature, relative humidity, and frequency. An example of the total attenuation due to atmospheric absorption

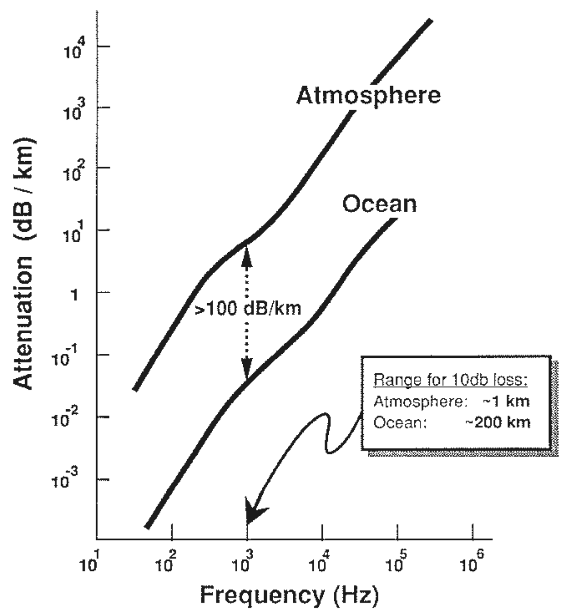

Fig. 1. Attenuation due to atmospheric absorption, A_{abs}.

Gilles A. Daigle

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Dr. Daigle works on a broad range of acoustics topics. He has contributed to hearing aid technology, telecommunications and multimedia acoustics, environmental acoustics, noise control, signal processing, the acoustics of the ear, and the physics of sound propagation.

A fellow of the ASA since 1988, Daigle has also won the ASA's prestigious R. Bruce Lindsay Award (1988), the Silver Medal of the French Society of Acoustics (2002), and the ASA's Helmholtz-Rayleigh Interdisciplinary Silver Medal (2005). He has served on the ASA's Executive Council (1992–1995), as ASA's Vice President (2000-2001), as Secretary General for the International Commission for Acoustics (1998–2001), and President of the International Commission for Acoustics (2001–2004). He currently serves as ASA's President and as Vice President Development for International INCE. Dr. Daigle will become the 5th President of International INCE in 2008.

Prior to his work at the National Research Council of Canada, Dr. Daigle served on the physics faculty at the Université de Moncton in Canada.

(A_{abs}) is shown by the curve labeled "Atmosphere" in Fig. 1.

For example, the attenuation is about 0.1 dB for every 1 km at 100 Hz, but is close to 100 dB for every 1 km at 10 kHz. For this reason, only low frequency sound propagates any significant distances. For comparison the attenuation in the ocean is shown by the lower curve.

The curves in Fig. 2 illustrate the attenuation of sound resulting from the sum of the first two terms in Eq. (1) for different frequencies. Since the attenuation due to atmospheric absorption is almost negligible at 63 Hz, the curve represents a decrease in level of 6 dB for every doubling of distance. However, the rapid increase of the attenuation due to atmospheric absorption normally restricts the propagation of higher frequencies.

The attenuation due to all other effects (A_{env}) is sketched in Fig. 3. Most naturally occurring ground surfaces are porous to

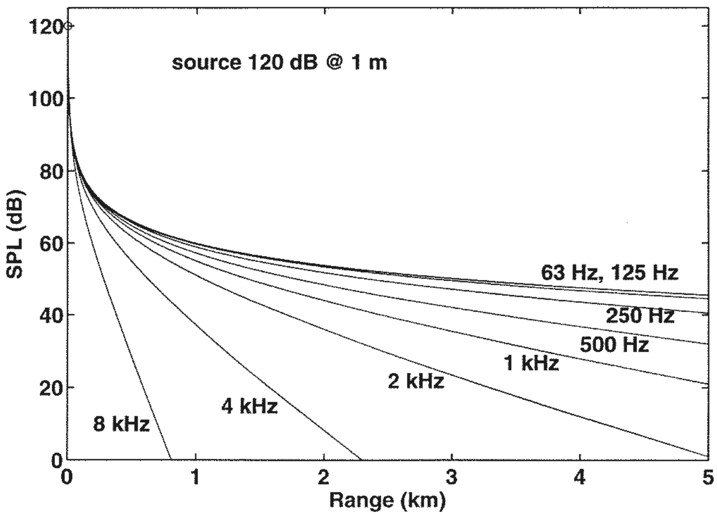


Fig. 2. The decrease in sound pressure level (SPL) with range due to the sum of the first two terms in Eq. (1).

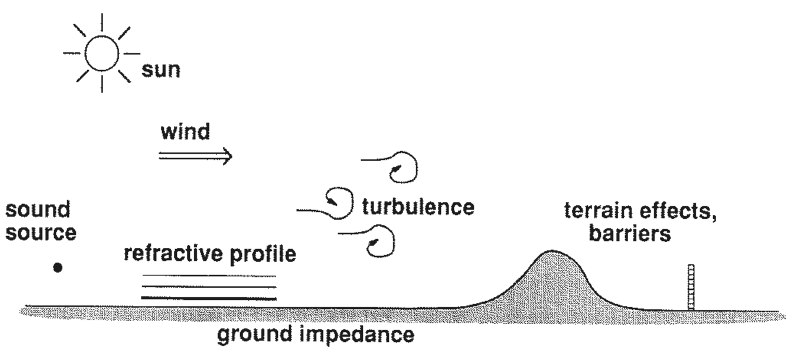
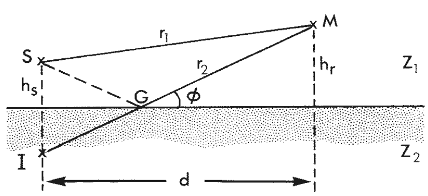


Fig. 3. Sketch of the attenuation from all other effects, A_{env}.

some degree and their acoustical properties can be represented by an acoustic impedance. In the atmosphere, both wind and temperature vary with height above the ground. The velocity of sound relative to the ground is a function of wind velocity and temperature; hence, it also varies with height—causing sound waves to propagate along curved paths (refraction). The atmosphere is also an unsteady medium with random variations in temperature and wind velocity. These random variations (turbulence) in the atmosphere cause the effective sound speed to fluctuate from point to point, so a nominally smooth wave front develops ripples. Consequently, the amplitude and phase of the sound at a distant point will fluctuate with time. The acoustical fluctuations are clearly audible in the noise from a large aircraft flying overhead. Finally, there are also terrain effects that cause diffraction.

A_{env} in the absence of refraction

Although propagation in the absence of refraction is not often attained in practice, it is sometimes a good approximation at shorter ranges, and the discussion serves to illustrate an important point. In the absence of refraction, sound rays are straight and there are always only two rays between source and receiver as illustrated in Fig.4. The equation at the bottom of Fig. 4 is the reflection coefficient if the incident waves are plane. We note that at grazing incidence ($N \rightarrow 0$), R_p always approaches –1. Therefore, the reflected sound cancels the direct sound at grazing incidence.



$$R_p = \frac{\sin\phi - Z_1/Z_2}{\sin\phi + Z_1/Z_2}$$

Fig. 4. Direct and ground reflected sound rays in the absence of refraction.

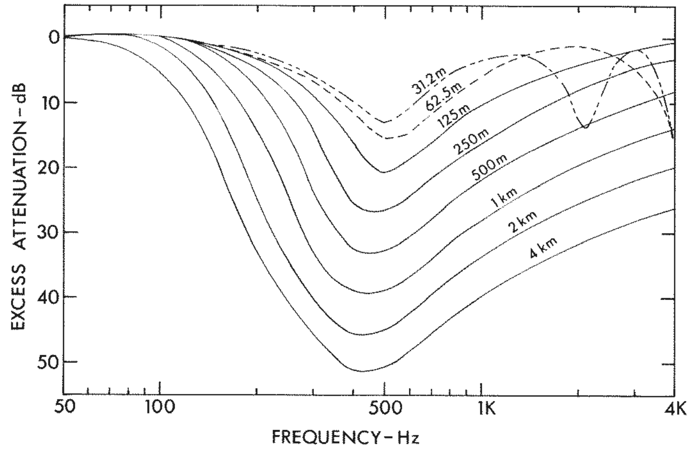


Fig. 5. The excess attenuation is A_{env} in the case of point source and receiver above grass covered ground.

In the case of a point source, the situation is not as simple but the consequences of a porous ground are illustrated in Fig. 5. The excess attenuation is A_{env} in the case of a point source and receiver relatively near a grass-covered ground. There is large dip around 500 Hz. The position of the dip does not change with source-receiver separation. Therefore, spatial averaging does not remove the decreased sound pressure levels at these frequencies. This has important consequences for environmental noise since 500 Hz is a common dominant frequency of many noise sources (ground transportation noise for example). Naturally occurring ground can provide a significant amount of natural shielding.

A_{env} in the presence of refraction and turbulence

The most commonly occurring situation is refraction and turbulence, since the velocity of sound usually varies with height above the ground. There are two distinct cases.

The speed of the wind decreases with decreasing height above the ground because of drag on the moving air at the surface. Therefore, the speed of sound increases with height during downwind propagation, and ray paths curve downward, as illustrated in Fig. 6. For propagation upwind, the sound speed decreases with height, and ray paths curve upward. See Fig. 7. In the case of upward refraction, a shadow boundary forms near the ground beyond which no direct sound can penetrate. Some acoustic energy does penetrate the shadow zone via diffraction and scattering from turbulence.

A similar situation exists in the case of refraction by temperature profiles.

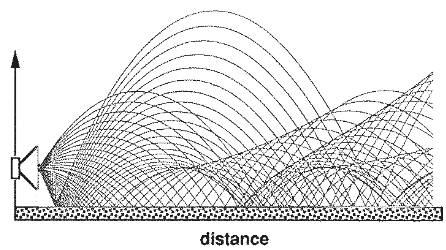


Fig. 6. Sound rays during downwind propagation or nighttime inversion.

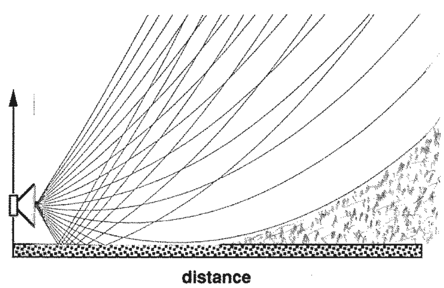


Fig. 7. Sound rays during upwind propagation or sunny days in summer.

During the day, solar energy heats the earth surface, resulting in warmer air near the ground. This condition is called a temperature lapse and is most pronounced on sunny days in summer. A temperature lapse causes ray paths to curve upward, as illustrated in Fig. 7. After sunset, there is often radiation cooling of the ground, which produces cooler air near the surface. Within the temperature inversion, the temperature increases with height, and ray paths curve downward. See Fig. 6. In winter, inversions can persist for days.

An example of the predicted attenuation (A_{env}) during downwind propagation or nighttime inversion is illustrated in Fig. 8 for a frequency of 1.2 kHz: Fast Field Program (FFP) and Parabolic Equation (PE) - solid curve; and an advanced ray tracing technique - dashed curve. The calculation is for grass covered ground and assumes moderate downwind propagation. The theoretical models show details due to interference between the various rays illustrated in Fig. 6. For comparison, the points in Fig. 8 are measurements reported by Parkin and Scholes in 1965. The measurements and these predictions will be discussed further in the next section.

An example of the sound field predicted during upwind propagation or daytime lapse is illustrated in Fig. 9. Sound is clearly seen penetrating the shadow zone due to scattering by turbulence. An example of the predicted attenuation (A_{env}) during upwind propagation or daytime lapse is illustrated in Fig. 10 for a frequency of 1.2 kHz. When compared to the attenuation shown in Fig. 8, the dominant feature of shadow zone reception is the marked increase in attenuation. This explains why sound is generally less audible upwind of the source.

Comparison of ISO 9613-2 with the Theoretical Model

For several years, ISO 9613 Part 2 has been in widespread use for calculating the attenuation of sound during propagation in

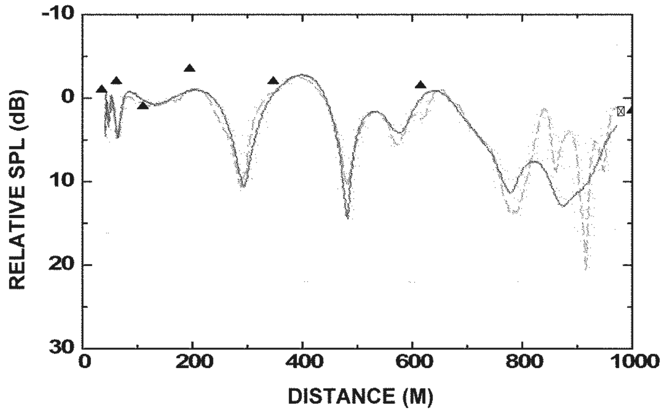


Fig. 8. The relative SPL is A_{env} predicted by three theoretical models in the case of grass-covered ground and a frequency of 1.2 kHz during moderate downwind propagation.

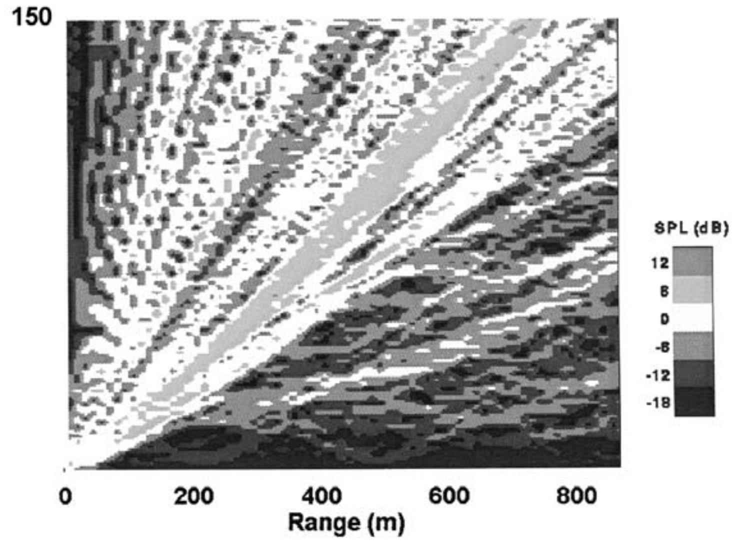


Fig. 9. Example of the sound field during upwind propagation or daytime temperature lapse. The figure is reproduced in color on page 121 of this issue.

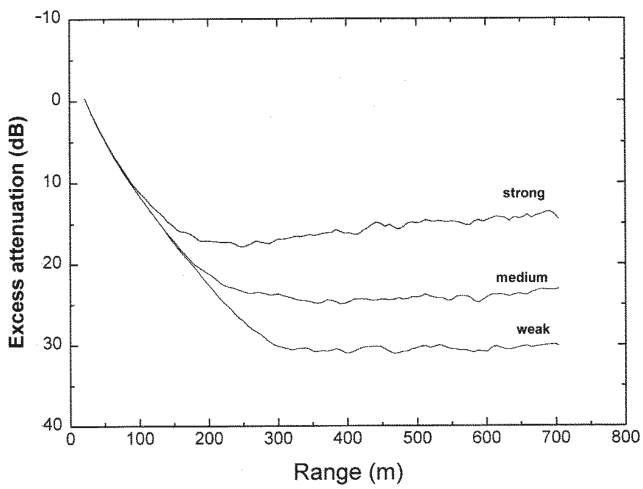


Fig. 10. The excess attenuation is A_{env} predicted in the case of downwind propagation or nighttime inversion. The calculation is performed for weak, medium, and strong turbulence.

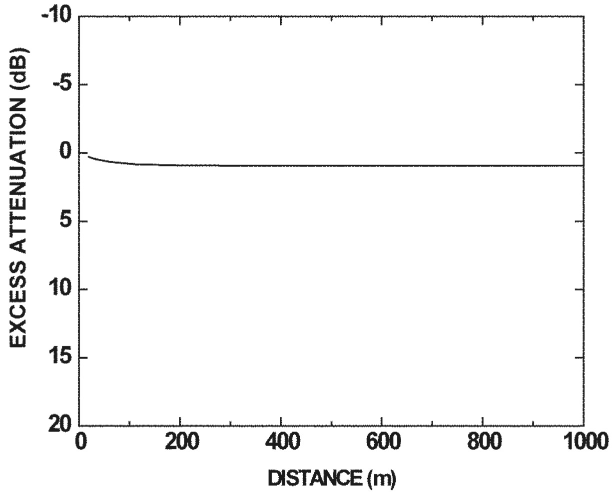


Fig. 11. The excess attenuation is A_{env} obtained from ISO 9613-2 in the case of soft ground for a frequency of 1.2 kHz.

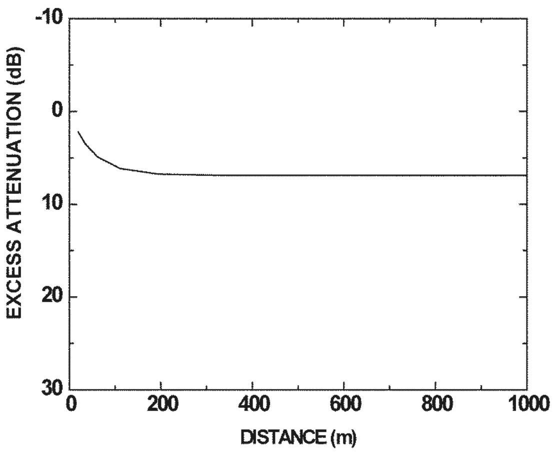


Fig. 12. The excess attenuation is A_{env} obtained from ISO 9613-2 in the case of soft ground for a frequency of 250 Hz.

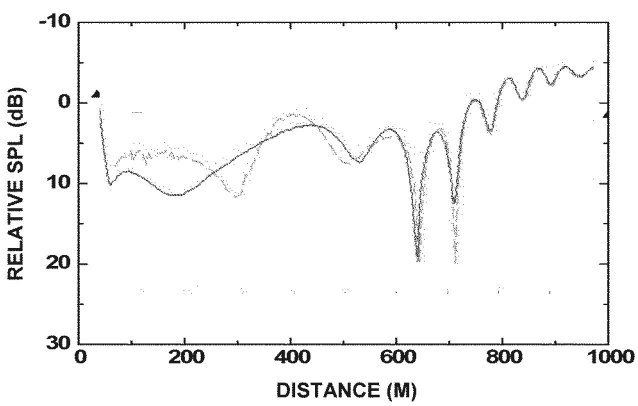


Fig. 13. The relative SPL is A_{env} predicted by three theoretical models in the case of grass-covered ground and a frequency of 250 Hz.

the open air in order to predict the levels of environmental noise. The Standard [9] specifies an engineering method to predict sound pressure levels under meteorological conditions favorable to propagation from sources of known sound emission. These conditions are for propagation downwind or propagation under a well-developed moderate ground-based temperature inversion. Three categories of reflecting surface are specified: (1) hard ground — paving, water, ice, concrete and all other ground surfaces having a low porosity, (2) soft ground — ground covered by grass, trees or other vegetation, and all other ground surface suitable for the growth of vegetation, and (3) mixed ground. Contrary to ISO 9613-2, the theoretical models allow a precise description of the reflecting surface (snow versus grass-covered ground, for example) as well as specifying the details of the wind and temperature profiles. A more complete comparison of ISO 9613-2 with theoretical models was discussed during INTER-NOISE 2005 [10]. This is a summary of that discussion.

The curve in Fig. 11 is the attenuation (A_{env}) calculated from ISO 9613-2 for the case discussed in Fig. 8. It is interesting to note the similarity between the Parkin and Scholes measurements (points in Fig. 8) and the ISO prediction in Fig. 11. A similar comparison is shown in Figs. 12 and 13 in the case of a frequency of 250 Hz and grass covered ground. Note that Fig. 13 shows an increase in levels at the higher frequencies that is not reproduced by the ISO calculation.

Snow-covered ground is a highly variable reflecting surface. The attenuation (A_{env}) expected from different layers of snow is illustrated in Fig. 14 for a frequency of 500 Hz: (a) layer (7 cm) of fresh snow, (b) layer of snow exposed to wind and sun, (c) layer of snow covered with freezing rain (ice). Note that as the layer of snow weathers by expose to wind and

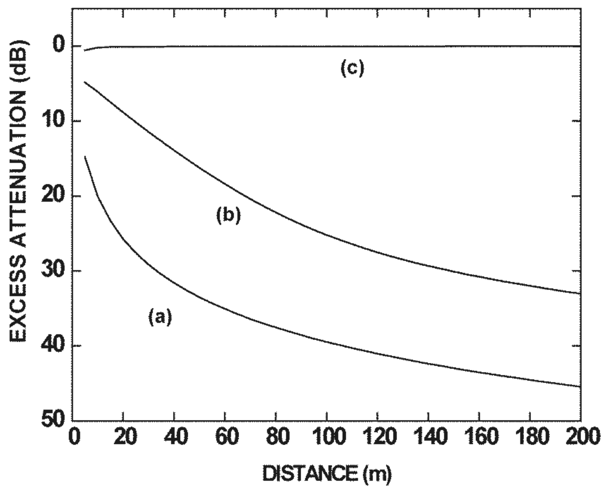


Fig. 14. The excess attenuation is A_{env} in the case of snow covered ground for a frequency of 500 Hz: (a) layer (7 cm) of fresh snow, (b) layer of snow exposed to wind and sun, (c) layer of snow covered with freezing rain (ice).

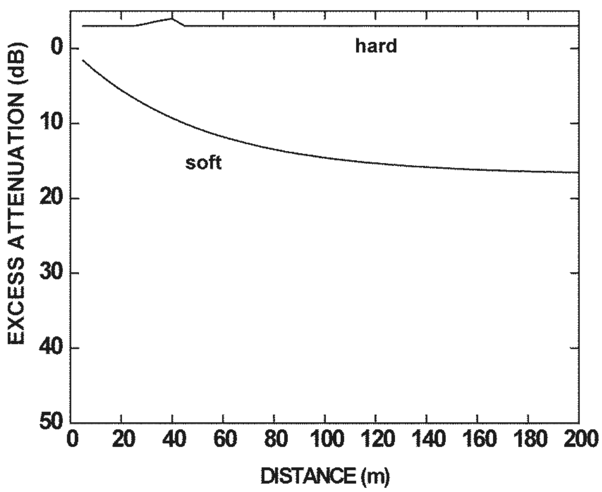


Fig. 15. The excess attenuation is A_{env} obtained from ISO 9613-2 for a frequency of 500 Hz.

sun, or after thawing and refreezing, the attenuation decreases. When the layer of snow has been covered by ice due to freezing rain, the attenuation is expected to approach that of hard ground.

For comparison the calculations are repeated for the same frequency using ISO 9613-2, and the results are shown in Fig. 15. The hard ground case is in good agreement with curve (c) in Fig. 14. The soft ground case in Fig. 15 (appropriate for grass-covered ground) does not show as much attenuation as snow covered ground.

Summary and Conclusions

When sound propagates outdoors many different wave propagation mechanisms, as well as ground properties and micrometeorological factors, are involved. Many of the situations discussed in the review were deliberately chosen to highlight the particular factor or combination of factors being investigated. The ground attenuation algorithm specified in ISO 9613-2 is also compared with predictions of rigorous theory for a number of selected cases.

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 Paul Donovan, Pan-American Editor

New York City has a New Noise Code in Effect

MEXICO

The 14th Mexican International Congress on Acoustics

The 14th Mexican International Congress on Acoustics will be held in the Convention Center at the Real de Minas Hotel in Leon, Guanajuato, Mexico.

Topics to be covered include:

- Audio
- Music
- Physical Acoustics
- Noise
- Bioacoustics
- Standards
- Architectural Acoustics
- MIDI
- DSP
- Mechanical Vibrations
- Communications

Participating Institutions are:

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USA

Stinson Joins ASA Executive Council

Michael R. Stinson, group leader for the Acoustics & Signal Processing Group in the Institute for Microstructural Sciences at the National Research Council of Canada, and a Distinguished International Member of INCE/USA has been elected a Member of the Executive Council of the Acoustical Society of America (ASA). He took office on 6 June 2007.

Dr. Stinson has been active in the ASA for many years. He was elected a Fellow of the Society in 1990 and has served as Associate Editor of the *Journal of the Acoustical Society of America* (JASA), as Chair of the Technical Committee on Noise, and as Technical Program Chair for the ASA's 1993 meeting held in Ottawa. He is currently an Associate Editor for *JASA Express Letters*.

Dr. Stinson's research activities have spanned a broad range of technical activities. He has studied the acoustics of the human ear canal in support of hearing aid design and has investigated the properties of materials used to control noise. Dr. Stinson has studied the physical mechanisms that affect how sound propagates through the atmosphere. He has also studied the use of arrays of microphones, for videoconferencing and surveillance.

Stinson received B.Sc. and M.Sc. degrees in physics from Simon Fraser University, and a Ph.D. in physics from Queens's University, Kingston, Ontario. He has been an adjunct professor at University of Waterloo since 1997 and was a visiting associate research scientist in Otolaryngology at Columbia University, New York, from 1986 to1994.

New York Noise Code Goes into Effect

The New York City Department of Environmental Protection (DEP), tasked with noise regulation, has developed a brochure to provide a brief overview of the new noise code. This article is a highly edited version of that brochure that emphasizes sources of machinery noise. The complete brochure can be found at http://home2.nyc.gov/html/dep/pdf/noise_code.pdf. For more information and the full text of the new code, please visit the website at nyc.gov/dep/html/airnoise.html.—Ed.

Introduction

New York City recently overhauled its noise code. The code was enacted in December 2005, and took effect in July 2007. This is the first comprehensive overhaul to the City's code in 30 years. The previous code was outdated and did not reflect the changing city landscape or advances in acoustic technology.

The new law states that:

"the making, creation or maintenance of excessive and unreasonable and prohibited noises within the city affects and is a menace to public health, comfort, convenience, safety, welfare and the prosperity of the people of the city."

Construction Noise

New York City is involved in a constant, noisy process of renovation and construction. To limit construction noise, the new noise code mandates that all construction be conducted in accordance with individual noise mitigation plans.

Noise Mitigation Plans

Those engaged in construction work must develop a noise mitigation plan prior to the start of work. The noise code prescribes ways to lessen the noise from each type of construction equipment,. For example, jackhammers will need to be outfitted with noise-reducing mufflers and/or have portable street barriers in place to reduce the sound impact on surrounding residents and businesses.

Construction work will never occur silently, but a reduction of only five decibels can minimize noise impact by nearly 20%.

Noise mitigation plans will be subject to the following procedures:

- Every construction site must post a noise plan on site.
- If noise complaints are received, an inspector will ensure the plan is posted and being followed and determine whether or not it needs modification.
- When construction activity is planned near "**sensitive receptors**" such as schools, hospitals and houses of worship, the party responsible for construction is expected to design their noise mitigation plan accordingly.

Impulsive sounds, those which occur abruptly for a short duration, are also restricted under the new code.

Containers and Construction Materials

The code also sets standards for noise levels created by handling containers and construction material on public streets. This includes the dropping of dumpsters and steel plates onto the streets. Prohibited noises are those exceed ambient sound levels by more than 10 decibels as measured from inside any property or on a public street at 15 feet from the source.

Hours of Construction Activity

- Construction may occur between **7:00 a.m. and 6:00 p.m. on weekdays**.
- Alterations or repairs to existing one- or two-family, owner-occupied dwellings, or convents or rectories may be performed on **Saturdays and Sundays** between the hours of **10 a.m. and 4 p.m.** provided that the dwelling is located more than 300 feet from a house of worship
- Work may take place after hours and on weekends only with express authorization from the agencies (the Departments of Buildings and Transportation) that grant permits. A **noise mitigation plan** must be in place before any authorization is granted.
- Emergency work, work necessary for public safety or work unable to be performed during normal work hours may be undertaken after-hours or on weekends. For example, watermain or gas line repairs or the hoisting of materials over a busy pedestrian walkway may qualify for work which requires construction activity outside of the normal hours.

Air Conditioners and Rooftop Circulation Devices

The noise code restricts the decibel levels created by air conditioners and circulation devices:

- Devices may not produce noise levels in excess of 42 decibels, as measured from a point 3-feet within the open door or window of a nearby residence.
- To account for the cooling needs of new construction or shifting building populations, the noise code limits buildings with multiple devices to a cumulative noise level of 45 decibels, measured in the same way.

If you suspect nearby air conditioners or circulation devices are generating illegal levels of sound, call 311 to file a complaint. Technicians may need to take several readings before enforcement can be deemed necessary, so please be patient and provide as much information as possible.

continued on page 109

Noise is a Menace to Public Health, Comfort, Convenience, Safety, Welfare and the Prosperity of the People of the City

 Bernard Berry, European Editor

Aircraft Noise and Emissions are Studied at a Symposium in La Baule, France

Belgium

ISMA 2008 to be Held in Leuven

The next ISMA Noise and Vibration Engineering Conference will be held in Leuven (Belgium) on 2008 September 15-17. The conference is organised by the division PMA of the K.U.Leuven.

ISMA2008 is part of a sequence of annual courses and biennial international conferences on structural dynamics, modal analysis and noise and vibration engineering. The last conference was organised in 2006 September, and was attended by more than 550 people. The technical program included 2 keynote lectures, 5 tutorial lectures and about 350 technical papers scheduled into 8 parallel tracks and 4 plenary poster sessions. Full CD-ROM conference proceedings were published.

Information on the conference topics, as well as on the procedure for submitting abstracts can be found on our website: http://www.isma-isaac.be

Registration fee is 500 EUR, 400 EUR for presenting authors (1 paper).
Student registration fee is 300 EUR.

Important dates:

October 1, 2007: *Start of online abstract submission.*
January 15, 2008: *Deadline for submitting abstracts.*
March 15, 2008: *Authors are notified regarding acceptance of their contribution, and receive instructions concerning the format of the paper.*
June 1, 2008: *Deadline for paper submission. (in digital format)*

France

ANERS 2007 is held in La Baule

ANERS 2007, the 2007 Aircraft Noise and Emissions Reduction Symposium was held in La Baule, France on 2007 June 25-27. The symposium was sponsored by the Association Aéronautique et Astronautique de France (AAAF). This was a follow-on to the 2005 Symposium held in Monterey, California, USA. The purpose was to review solutions to noise and emission problems through airplane design as well as operational procedures and land-use options.

Inquiries concerning the availability of the symposium proceedings should be directed to the Secretariat, AAAF, 6 rue Galilée, 75016 Paris, France. Telephone: +33 (0) 1 56 64 12 33; Fax: +33 (0) 1 56 64 12 31. E-mail: m.aude@club-internet.fr. The web site for the symposium is www.aaafasso.fr/aners2007.

United Kingdom

NSCA Issues Ten Targets for Tranquility

NSCA is the environmental protection charity working to promote environmental improvement by encouraging policies and practice which prevent any increase in noise, and encourage the reduction of noise.

NSCA believes the following must be targets for the Noise Strategy for England and Noise Action Plans, and applied throughout the UK, to achieve a healthy noise climate for us all:

1. Prevent the erosion of the UK's remaining quiet areas, both urban and rural.
2. Promote management of neighbour and neighbourhood noise so as to ensure acceptable levels of noise in neighbourhoods that contribute to good quality of life.
3. Make available sufficient resources for consistent enforcement of existing noise control legislation and make provision for implementation of future instruments for managing noise.
4. Ensure potential noise impacts are integrated into local and regional planning, transport and environmental policy.
5. Invest ownership of noise maps and noise action plans with local authorities, empowering them to take action on environmental noise – including the development of noise management plans in partnership with local agencies concerned with environmental quality.
6. Alignment of the management of noise from aviation and associated operations with other areas of policy.
7. The implementation of quieter road construction techniques in all new roads and in road improvement and repair schemes in line with European best practices.
8. A robust noise labelling scheme for products, encouraging manufacturers to minimise the noise impacts.

9. Improved, enforceable standards of sound insulation in new and existing buildings
10. Put noise on the curriculum – ensuring future generations understand the health and social impacts of noise.

The organization can be reached at: NSCA, 44 Grand Parade, Brighton BN2 9QA, UK. Web site: www.nsca.org.uk.

Guidelines for Defining Quiet Areas are Available from Defra

The UK Department for Environment, Food and Rural Areas (Defra) has now posted on their web site a 2006 September report, Research into quiet areas—recommendations for identification. The report was produced under a contract with TRL Limited, but published by Defra. Identification and preservation of quiet areas is required by the European Union Environmental Noise Directive, 2002/49/EC. The 38-page report summarizes previous research and contains recommendations for the identification of quiet areas. Examples are given. The report may be downloaded from the Defra web site at www.defra.gov.uk/environment/noise/research/pdf/quiet-areas.pdf.

DEFRA Issues Guidelines for Defining Quiet Areas

Pan-American News *continued from page 107*

Refuse Collection Vehicles

Though the collection of garbage and refuse is critical to the health and safety of City residents, noise from this process can disrupt local communities.

To limit such disruptions, the new noise code sets a more enforceable standard in order to reduce unreasonable noise emanating from refuse collection vehicles.

Maximum sound levels may never exceed 80 decibels (measured at a distance of 35 feet, not including the compaction cycle).

Between the hours of 11 pm and 7 am, maximum sound levels within 50 feet of a residential property may not exceed 85 decibels (measured at a distance of 35 feet and including compaction. This standard will be reduced to 80 decibels in 2012).

Motor Vehicles and Motorcycles

The new noise code restricts noises coming from vehicles, including motorcycles, and prohibits excessive sound from the muffler or exhaust of motor vehicles operating on a public right-of-way where the speed limit is 35 mph or less. Excessive sound is defined as sound that is:

- plainly audible at a distance of 150 feet or more from vehicles of less than 10,000 lbs;
- plainly audible at a distance of 200 feet or more from vehicles of more than 10,000 lbs; e.g., trucks;
- plainly audible at a distance of 200 feet from a motorcycle.

Horn Honking

The use of vehicle horns is not permitted except as a warning in situations of imminent danger.

Remedying the Noisy Condition

Compliance with the code is what we are trying to achieve. The various instances and configurations of an offending business and its nearby residences can vary as to the time of day and proximity of the source. In the first instance, if possible, the best way to get a particular business into compliance is to get them to change any offending behavior. Often the given set of circumstances provides a more challenging problem. A correction could call for a combination of soundproofing, physically changing the configuration of the business's operation or modifying sound equipment.

As an incentive to achieve compliance, the code offers any offending business no penalty for the first violation if the business certifies that they have corrected the condition and provides satisfactory and verifiable evidence of the correction. In this way, the money that would have been paid as a fine will be invested in mitigating the noise problem.

If the offending condition is not remedied, multiple violations may result in very stiff penalties or sealing of the sound equipment.

Marion Burgess, Asia-Pacific Editor

AUSTRALIA

Successful Australian Conference

A successful ICSV14 conference was held in late July in Cairns, North Queensland, Australia. The conference had an extensive technical program with renowned keynote speakers. Many of the attendees appreciated the opportunity provided by the location near the Barrier Reef and the Rainforest areas to follow the conference attendance with sightseeing in the area. ICSV 15 will be held in Korea in July 2008.

CHINA

Message from the President of INTER-NOISE 2008

This is a message from the president of the INTER-NOISE 2008 Congress taken from the congress web site,www.internoise2008.org. Professor Tian is president of the Acoustical Society of China and director of the Institute of Acoustics, Chinese Academy of Sciences. More information about the congress is on the web site.—Ed.

The Organizing Committee of the 37th International Congress and Exposition on Noise Control Engineering (INTER-NOISE 2008) extends a warm welcome and invitation to participate fully in what promises to be the premier noise control engineering conference of 2008. The INTER-NOISE 2008 Congress, sponsored by the International Institute of Noise Control Engineering (I-INCE) and co-organized by the Institute of Acoustics, Chinese Academy of Sciences (IACAS) and the Acoustical Society of China (ASC), will be held at the Shanghai International Convention Center, Shanghai, China, from 26–29 October 2008.

In addition to being an interesting and pleasant venue for the congress, Shanghai is truly a historical but modern city. The Congress will feature a broad range of high-level research papers from around the world, as well as an extensive exhibition of noise and vibration control and measurement equipment and systems. Distinguished speakers will provide additional stimulation for our technical sessions and discussions with a focus on our theme of "We are Active but Quiet."

The INTER-NOISE 08 Web Site is Active

We sincerely welcome you to INTER-NOISE 2008, invite you to participate fully in all aspects of the Congress, and eagerly anticipate what will undoubtedly be a technically successful and personally enjoyable Congress in one of the most beautiful locations in the world.

Sincerely,
Jing Tian
President, INTER-NOISE 2008

JAPAN

Draft Report on Revision of EQS for Aircraft Noise

The Expert Committee on Noise Evaluation Method issued a draft report on revision of EQS (Environmental Quality Standard) for Aircraft Noise. The committee was organized in March 2007 as a substructure of Noise and Vibration Committee in Central Environment Council. The special mission of the committee was to review the present noise descriptor WECPNL (Weighted Equivalent Continuous Perceived Noise Level) and to propose a reasonable noise descriptor that will be appropriate for the future aircraft noise policy in Japan. Various noise descriptors such as L_{den}, L_{dn} and $L_{Aeq,24}$ were compared with Japanese WECPNL. It is shown that they are all well correlated with WECPNL at many locations around Japanese airports. It is also shown that these metrics can avoid present problem of accuracy in the determination of Japanese WECPNL that is computed based on measurement data ($L_{A,Smax}$) and simplified empirical formula. The expert committee finally concluded that the choice of L_{den} (day-evening-night average sound level) is preferable to the present WECPNL in considering total aircraft noise exposure to residents, and recent progress in noise measurement technologies and prediction methods, and international harmonization in noise control policy.

NEW ZEALAND

New Zealand Company wins Competition for La Philharmonie de Paris

Marshall Day Acoustics has just won a design competition with Atelier Jean Nouvel for a new 2400 seat concert hall for Paris. The new concert hall, to be located in the Parc de la Villette, has been planned by the City of Paris and the Ministry of Culture for over 20 years.

The selection of a design team for the "La Philharmonie de Paris," one of the most important cultural buildings proposed this century, was conducted as a two stage competition. In the first stage 98 design teams submitted credentials to undertake the design. The list featured a number of significant international architects including Frank Gehry, Renzo Piano, and the eminent French architect Jean Nouvel who had invited Marshall Day Acoustics to join his team as acousticians.

In January 2007, six teams were short listed to further develop their plans for the final selection. The Jean Nouvel/Marshall Day design won the competition. The expected cost is 205 million Euro, and completion is scheduled for 2012.

International Representatives

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Ecophon Launches New Web Site

Just recently, Ecophon launched their new website. Through www.ecophon.com, architects, acousticians, ceiling contracters and end-users are able to access all relevant information to establish good working, learning or healing envrionments for the eye, the ear and the mind.

Scantek, Inc.

New Software for Community Noise Analysis

Scantek, Inc. is pleased to announce the availability of the new software package, "Capture Studio Editor," used for editing the results of acoustical measurements form CESVA instruments. The new CSE software enables the user to edit data acquired by the sound level meter and spectrum analyzers SC 310, SC-30 and SC1 60.

The main characteristics of CSE are:

- Selection and elimination of measurement intervals.
- Calculation of overall, spectral, and statistical parameters from the new measurement interval.
- Dynamic selection of the intervals for editing; zoom function.
- Selective export of functions to Access, Excel, and Text format.

This first version of CSE edits files of the CESVA SC 310 sound level meter for the sound level meter and 1/3 extended spectrum analyzer modes. CSE is available for download from the CESVA website http://www.cesva.com/?lang=eng.

For more information, contact Contact: Richard J. Peppin, Scantek, Inc., Phone +1 401 290 -7726; Fax +1 410 290 9167; e-mail: PeppinR@ScantekInc.com.

New Building and Human Body Vibration Meters Announced

Scantek, Inc. has announced the availability of two new vibration meters from MMF. Both provide logging and simultaneous triaxial measurements to meet most national and international standards.

First, Building Vibration Instrument InnoMeter 4150-3/KS813B-BDG. This software instrument of the VibroMatrix PC based vibration measuring system and the triaxial accelerometer have been designed for the measurement of vibration in buildings. The vibration meter records the vector sum and, after alarm tripping, also the instantaneous values of three axes with a sampling rate of 2500 samples/s in a text table format.

For more information, visit http://www.mmf.de/triaxial_accelerometers.htm#KS813B-BDG or http://www.mmf.de/pc_data_acquisition.htm#InnoMeter_4150-3

Second, Triaxial Human Vibration Meter VM30-H. This pocket-sized instrument was developed for hand-arm and whole-body vibration measurement. In addition, it also can measure general machine vibration. The precision instrument features a logging function. (As a logger: either the three axes or the vector sum. In the manual save mode: store mixed data (three axes and vector sum).) It comes with PC software. Long battery life and waterproof case.

For more information, visit http://www.mmf.de/human_vibration.htm

Or, for information on either instrument, contact Contact: Richard J. Peppin, Scantek, Inc., Phone +1 401 290 -7726; Fax +1 410 290 9167; e-mail: PeppinR@ScantekInc.com.

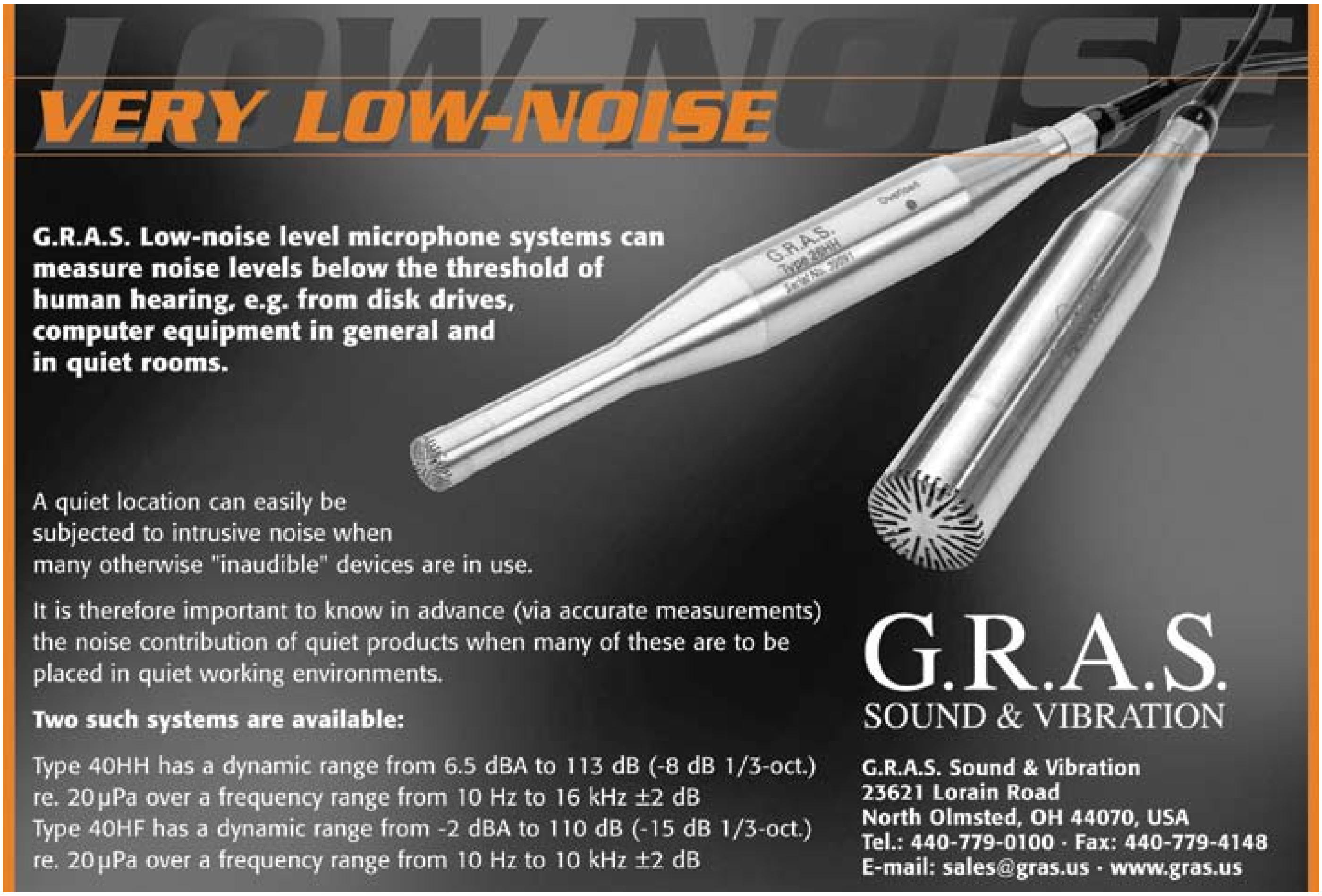
Brüel & Kjær

Hand-held Analyzer Type 2250 – Now With FFT Analysis Software

Brüel & Kjær has announced that the Type 2250 Hand-held Analyzer is now available with FFT analysis software. Type 2250's combination of software application modules and hardware makes the analyzer a dedicated solution for high-precision measurement tasks, in environmental, occupational and industrial noise and vibration application areas.

Frequency analysis based on the Fast Fourier Transform (FFT) algorithm is the tool of choice for measurement and diagnostics of machinery noise and vibration. The frequency "profile" of a machine is its fingerprint, revealing its sources of noise and vibration and their paths to the measurement position.

The user can zoom into the measurement to any desired frequency range with more resolution than anyone could possibly need. Type 2250 is said to be the perfect tool, whether you work with product noise and vibration, machinery analysis and troubleshooting, or product quality testing.



Available from the INCE/USA Page at the Atlas Bookstore

www.atlasbooks.com/marktplc/00726.htm

Noise and Vibration Control – Leo L. Beranek

This classic text on noise and vibration control is very widely used throughout the world. The book is divided into three parts: the basics of noise control (including measurement methods, acoustical materials, and sound propagation), application of these principles to reducing noise from sources, and criteria for noise control.

Noise Control in Buildings – Cyril M. Harris

Noise Control in Buildings features contributions by leading authorities on noise control, and contains a very complete set of data on the properties of acoustical materials and on the sound insulation of walls and floor/ceiling constructions. This wealth of technical information provides an invaluable resource for the professional as well as the non-professional.

LMS

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PCB Piezotronics

A new software package extends Type 2250's functionality with reverberation time analysis. Reverberation time can be measured using either Impulsive Excitation (Schroeder Method), such as from a pistol or balloon burst, or using Interrupted Noise with either the unit's own internal signal generator or an external one.

For the measurements, a wide range of useful accessories including power amplifier, sound sources, and wireless transmission kit are available. And PC software is available for post-processing and reporting.

Type 2250 Hand-held Analyzer with Reverberation Time Software is intended for Occupational Health Officers assessing noise levels at workplaces, Environmental Officers or Consultants assessing sound insulation in new or renovated buildings, Consultants or Acousticians assessing room acoustics in classrooms, auditoria, workspaces and public spaces, and manufacturers or consultants estimating the sound power level for CE-labelling of tools or machinery.

For additional information please contact your local sales representative or go to http://www.type2250.com.

LMS

LMS Virtual.Lab Fast Trim For Acoustic Multilayer Modeling

LMS has announced the introduction of LMS Virtual.Lab Fast Trim, a dedicated modeling and simulation solutions to assess the acoustic behavior of multi-layer acoustic trim panels. Acoustic isolation packages based on these multi-layer trim are increasingly used in automotive and aerospace applications to efficiently control the interior sound of a vehicle or aircraft and to increase overall driver and passenger comfort.

Trim panels with multiple layers set specific challenges for acoustics engineers in terms of creating simulation models that deliver reliable results in the higher frequencies ranges. In these ranges, acoustic decoupling as well as porous and visco-elastic effects dominate the acoustic performance.

The new Fast Trim solution in LMS Virtual.Lab Acoustics is said to be capable of accurately modeling these critical effects with minimal efforts and therefore delivers the required reliability.

After setting up the multilayered layout of a panel and defining the properties of its constituting layers, the transfer admittances of the complete trim structure are calculated as function of frequency. In a subsequent vibro-acoustic FE (Finite Element) analysis, LMS Virtual.Lab Acoustics simulates the performance of the multilayer trim in the presence of flexible panels from a vehicle body or airplane fuselage. Short simulation runs reliably predict the acoustic performance at higher frequency and accelerate the acoustic optimization process. This allows acoustics engineers to better exploit the tremendous potential of trim when shaping the targeted interior sound.

For more information on LMS Virtual.Lab, please visit http://www.lmsintl.com/virtuallab

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illbruck acoustic, inc.

illbruck acoustic, inc. has introduced PROSPEC Decibel Drop.

Decibel Drop is a high-performance viscoelastic damping compound that decreases the sound traveling to adjacent rooms. PROSPEC Decibel Drop is said to be appropriate for use in commercial spaces, broadcast/audio facilities, home theaters and multifamily dwellings.

PROSPEC Decibel Drop is said to be easy to install between layers of drywall or plywood in walls and ceilings or between layers of subflooring. The product comes in a cartridge and is applied with a standard caulk gun. Two to three cartridges cover 32 square feet, applied randomly over the drywall surface area.

For more information or to locate a distributor, visit www.illbruck-acoustic.com/pdd.

PCB Piezotronics

PCB Piezotronics Debuts Dynamic Pressure Sensor for Gasoline or Diesel Engine Combustion Monitoring

PCB Piezotronics (PCB®) has introduced a new dynamic pressure sensor, ideal for measuring dynamic combustion pressure in gasoline or diesel engines. The high temperature (to +600° F/+315° C) piezoelectric charge output sensor, structured with naturally stable quartz sensing elements, is well-suited to measure rapidly-changing pressure fluctuations over a wide amplitude and frequency range.

The un-cooled design measures pressure with low thermal shock error, and ground isolation avoids electrical interference from electronic ignition systems, making the sensor equally well-suited for research and development or monitoring applications. A solid-state construction, hermetically-sealed housing, and laser-welded flush diaphragm help ensure durability in harsh engine testing environments.

The Model 175A01 pressure sensor is available with a dynamic range to 4000 psi (275 bar), and sensitivity of 1.5 pC/psi (21 pC/bar). Alternate models and mounting adaptors are available for various engine types.

For detailed specifications, drawings, or additional information, please visit www.pcb.com

British Airways Completes B-747-400 Predictive Monitoring System Order

Inflight Warning Systems, Inc. (IWS) and the IMI Sensors division of PCB Piezotronics (PCB®) are pleased to announce receipt of a British Airways order which completes the long-term program to incorporate predictive maintenance Vibration Monitors, designed to detect bearing failure in air recirculation fans on commercial aircraft. These monitors, which include the use of PCB® sensors as a key component, have been incorporated into 11 applications aboard major commercial airliners throughout the world.

The IWS vibration monitor provides early detection and prevention of fan failure. By installing monitors onto fans for cabin air recirculation and electrical equipment cooling exhaust, the product provides early warning of wear on fan bearings. Installation of vibration monitors will allow normal fan operation and automatically terminates operation of such fans, when a bearing failure is imminent. Air recirculation and equipment cooling fans have a variant life cycle, depending upon usage. Failure of these fans often results in the interruption of normal flight operations and costly repairs.

For further information, contact: Molly Bakewell: Tel: +1 716 684 0002, ext. 2663; e-mail: mbakewell@pcb.com

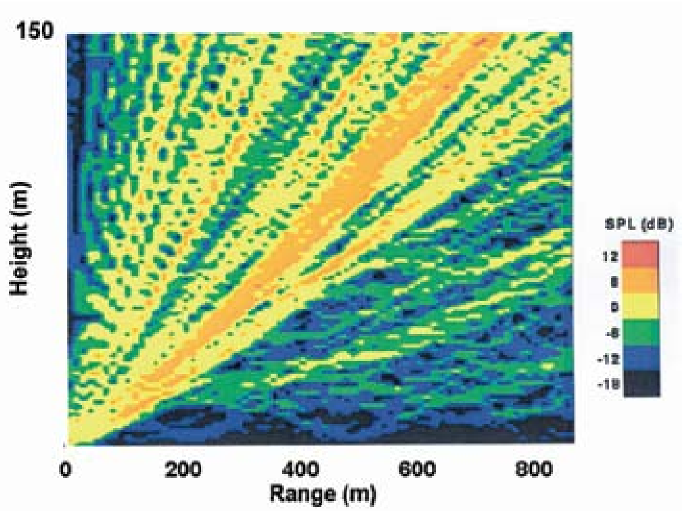

Fig. 9. Example of the sound field during upwind propagation or daytime temperature lapse. See page 103.

Acknowledgements

INCE/USA Liaison Program

ACO Pacific, Inc.	Belmont, California
AVAC Continuing Education	Pittsburgh, Pennsylvania
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Acoustical Solutions	Richmond, Virginia
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Harris Miller Miller & Hanson Inc.	Burlington, Massachusetts
Noise Control Engineering, Inc.	Billerica, Massachusetts
Overly Door Company	Greensburg, Pennsylvania
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Vibro-Acoustics	Scarborough, Ontario, Canada
Wyle Laboratories	Arlington, Virginia

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Portugal	Laboratorio Nacional de Engenharia Civil, Lisboa
Sweden	Department of Applied Acoustics, Chalmers University of Technology, Gothenburg
USA	Graduate Program in Acoustics, The Pennsylvania State University, State College, Pennsylvania

Conference Calendar

Below is a list of congresses and conferences sponsored by International INCE and INCE/USA. A list of all known conferences related to noise can be found by going to the International INCE page on the Internet, www.i-ince.org.

2007 October 22-24

NOISE-CON 07, The 2007 National Conference on Noise Control Engineering

This conference will be held at the Grand Sierra Resort in Reno, Nevada.

Contact: Institute of Noise Control Engineering, INCE/USA Business Office, 210 Marston, Iowa State University, Ames, IA 50011-2153
Tel. +1 515 294 6142 • Fax: +1 515 294 3528
E-mail: IBO@inceusa.org
Internet: http://www.inceusa.org.

2008 July 27-30

NOISE-CON 08

The 2008 National Conference on Noise Control Engineering

The conference will be held at the Hyatt Regency Dearborn, Dearborn, Michigan. The 2008 Sound Quality Symposium will immediately follow the conference.

Contact: Institute of Noise Control Engineering, INCE/USA Business Office, 210 Marston, Iowa State University, Ames, IA 50011-2153.
Tel. +1 515 294 6142 • Fax: +1 515 294 3528
E-mail: IBO@inceusa.org
Internet: http://www.inceusa.org.

2008 October 26-29

INTER-NOISE 2008

The 2008 International Congress and Exposition on Noise Control Engineering

Shanghai, China

Contact: Institute of Acoustics, Chinese Academy of Sciences, 21 Beisihuanxilu Road, Haidian District, Beijing, P.R. China.
Tel: + 8610-62553765 • Fax: +8610-62553898
E-mail: internoise@mail.ioa.ac.cn
Internet: www.internoise2008.org

2009 August 23-26

INTER-NOISE 2009

The 2009 International Congress and Exposition on Noise Control Engineering

Ottawa, Canada

Contact: Institute of Noise Control Engineering-USA
Pam Reinig, Congress Coordinator
INCE Business Office
210 Marston, Iowa State University
Ames, IA 50011 USA
Tel: 515-294-0261, FAX: 515-294-3528
E-mail: ibo@inceusa.org

Directory of Noise Control Services

Information on listings in the Directory of Noise Control Services is available from the INCE/USA Business Office, 210 Marston, Iowa State University, Ames, IA 50011-2153; +1 515 294 6142; Fax: +1 515 294 3528; IBO@inceusa.org. The price is USD 400 for 4 insertions.

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Mark your calendar and plan to participate!

NOISE-CON 08

Hyatt Regency Dearborn • Dearborn, Michigan, USA
28-30 July, 2008

The equipment exposition, managed by Richard Peppin of Scantek, Inc., will offer displays of materials, instruments and services in the noise and vibration control field. An Expo reception and off-site social will also be included. Potential exhibitors are encouraged to contact Peppin for details, including costs and floor plan (PeppinR@AMSE.org).

ACTIVE 06 CD-ROM

Proceedings of ACTIVE 2006, The 2006 International Symposium on Active Control of Sound and Vibration

This searchable CD-ROM contains 634 full length papers on active control of noise and vibration. All papers are in PDF format.

The latest in the ACTIVE series of international symposia on active control of sound and vibration was organized by the University of Adelaide, Adelaide, Australia, and was held on September 18-20, 2006. Seventy three papers from ACTIVE 06 are on this CD-ROM.

The remaining papers are from:

ACTIVE 04
Williamsburg, USA

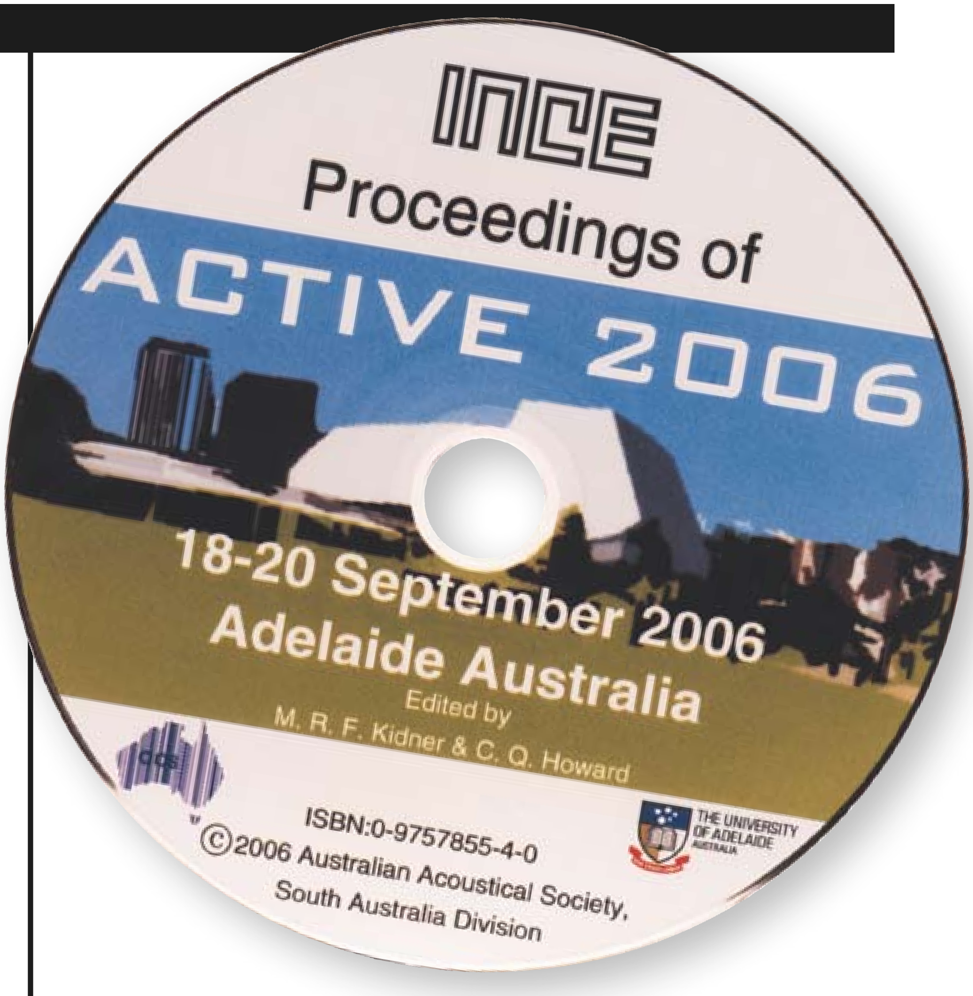
ACTIVE 02
Southampton, UK

ACTIVE 99
Fort Lauderdale, USA

ACTIVE 97
Budapest, Hungary

ACTIVE 95
Newport Beach, USA

These papers cover all areas of active control of sound and vibration.



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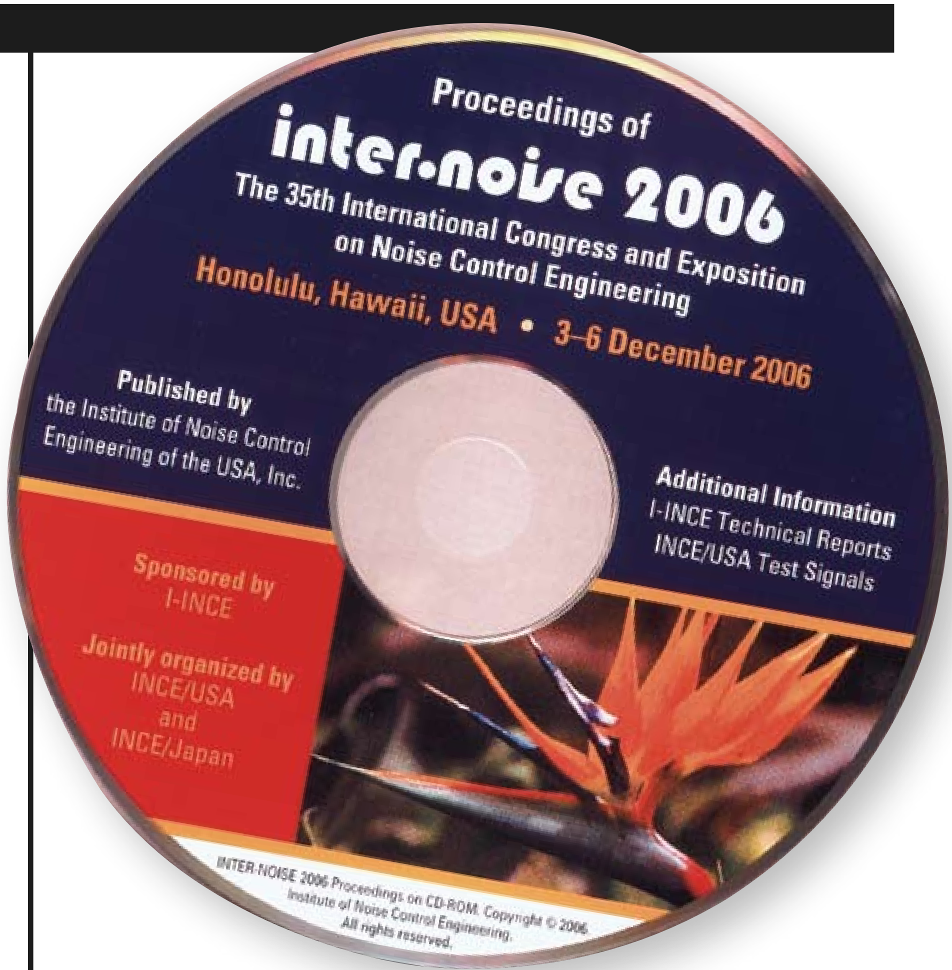
INTER-NOISE 06 CD-ROM

This searchable CD-ROM contains the 662 papers presented at INTER-NOISE 06, the 2006 Congress and Exposition on Noise Control Engineering. This, the 35th in a series of international congresses on noise control engineeering was held held in Honolulu, Hawaii, USA on December 3-6, 2007. The theme of the congress was "Engineering a Quieter World."

The technical topics covered at INTER-NOISE 06 included:

- Aircraft and Airport Noise Control
- Active Noise and Vibration Control
- Building Acoustics
- Community Noise
- Barriers
- Fan noise and aeroacoustics
- Highway, automobile and heavy vehicle noise
- machinery noise
- noise policy
- product noise emissions
- railway noise
- sound quality

These papers are a valuable resource of information on noise control engineering that will be of interest to engineers in industry, acoustical consultants, researchers, government workers, and the academic community.



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