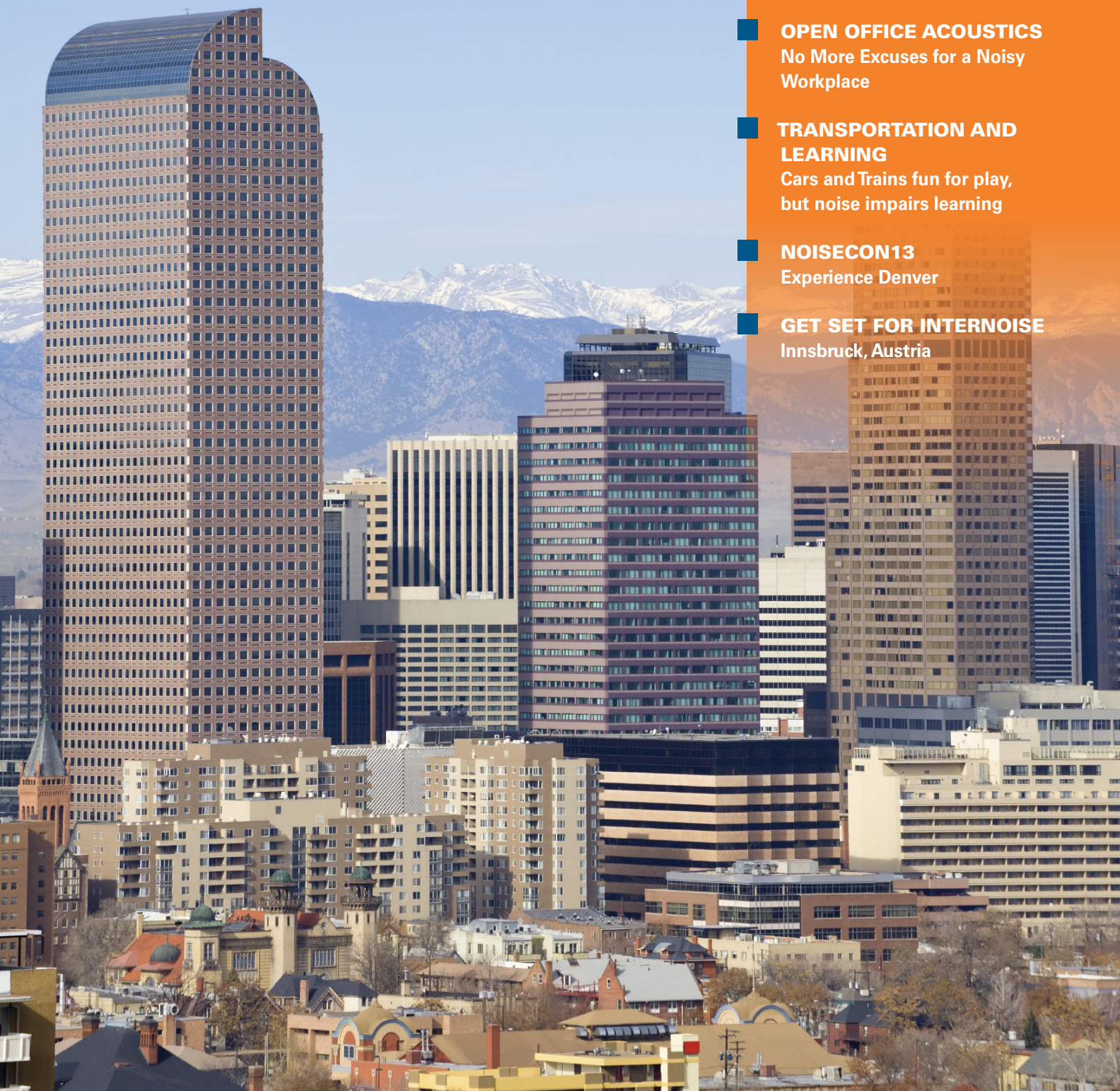
NOISE/NEWS INTERNATIONAL

Volume 20, Number 1
2013 March

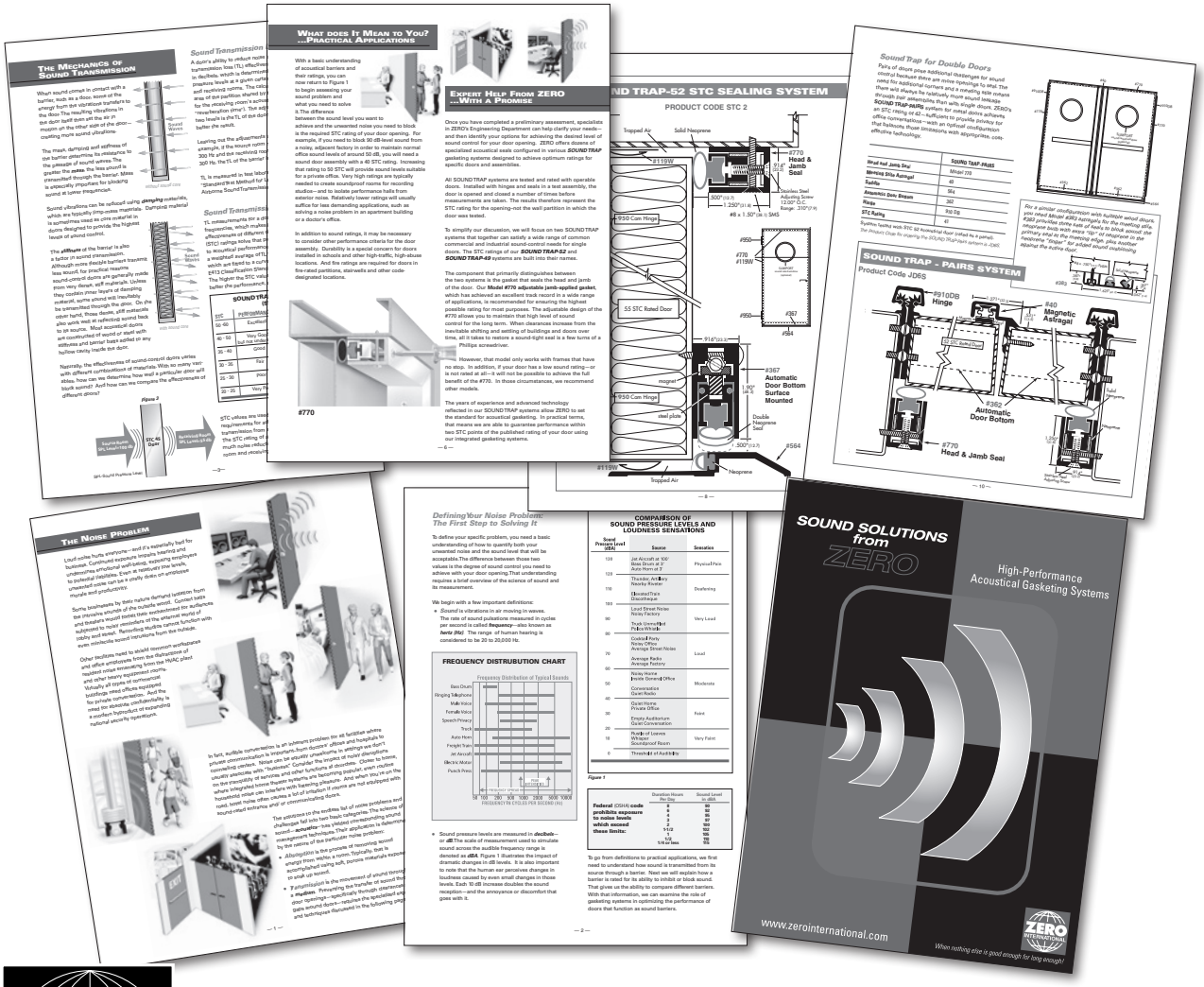
A quarterly news magazine with an Internet supplement published by I-INCE and INCE/USA



- **OPEN OFFICE ACOUSTICS**
  No More Excuses for a Noisy Workplace
- **TRANSPORTATION AND LEARNING**
  Cars and Trains fun for play, but noise impairs learning
- **NOISECON13**
  Experience Denver
- **GET SET FOR INTERNOISE**
  Innsbruck, Austria

TUNE INTO ZERO's SOUND SOLUTIONS

ZERO is a world-wide leader in high-performance acoustical control for doors, windows and walls. Nobody does sound control better — we use advanced technology and testing to master the challenges of creating an effective barrier and preventing gaps in that barrier for the life of the assembly. Our systems are rated for use in sound studios and recording facilities, music halls, etc — up to 55 STC. Let us help you close the door on noise — contact us for a copy of our 20 page Sound Control brochure, and our 72 page Product Catalog, or download from our website.



ZERO INTERNATIONAL

Phone: 1-800-635-5335 / 718-585-3230 • Fax: 718-292-2243

Email: zero@zerointernational.com • Web Site: www.zerointernational.com

NOISE/NEWS INTERNATIONAL

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

Volume 21, Number 1 **2013 March**

Features

Departments

Cover Photo:
View of Denver, Colorado skyline, venue for the NoiseCon13 and the Wind Turbine Noise Conference, August 25-28, 2013.

Produced by
The Institute of Noise Control Engineering of the USA, Inc.
Business Office
100 East Washington Street
Springfield, IL 62701
USA

Noise/News International is a quarterly news magazine published in PDF format only 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 available for free download to members of INCE/USA, the members of Member Societies of International INCE and others. Thus, the availability of NNI is a benefit to these members, and to the noise control engineering community. 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:** The Member Societies of International INCE and members of INCE/USA will be notified by e-mail when a new edition of NNI has been posted on the NNI web site and is available for download. Anyone who wishes to be notified by e-mail of the availability of NNI for download may go to the NNI web site and sign up as a subscriber. Any problems related to sign-up or other issues should be directed to the Institute of Noise Control Engineering Business Office, 100 East Washington Street, Springfield, IL 62701. **EDITORIAL CORRESPONDENCE:** Address editorial correspondence to James K. Thompson, PhD, PE, INCE-USA Business Office, 100 East Washington Street, Springfield, IL 62701. Telephone: 412.228.9127; Fax 217.528.6545; e-mail: jkthompson@cdc.gov.

ADVERTISING: For information about advertising, contact Richard J. Peppin, Advertising Sales Manager, 301.910.2813, e-mail: PeppinR@ScantekInc.com.

NOISE/NEWS INTERNATIONAL

This PDF version of Noise/News International 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). This is the third volume that is being published in PDF format only. The PDF format means that the issues can be read by freely available software such as that published by Adobe and others. It reduces publication time, saves printing costs, and allows links to be inserted in the document for direct access to references and other material. Individuals can sign up for a free subscription to NNI by going to the web site http://www.noisenewsinternational.net

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 and its Internet Supplement

www.noisenewsinternational.net

The primary change in this PDF-only volume of *NNI* is the ability to have "hot links" to references, articles, abstracts, advertisers, and other sources of additional information. In some cases, the full URL will be given in the text. In other cases, a light blue highlight of the text will indicate the presence of a link. At the end of each feature or department, a light blue back to toc will take the reader back to the table of contents of the issue.

- The Internet supplement contains additional information that will be of interest to readers of *NNI*. This includes:
- The current issue of *NNI* available for free download
- *NNI* archives in PDF format beginning in 1993
- A searchable PDF of annual index pages
- A PDF of the current *NNI* conference calendar and a link to conference calendars for worldwide meetings
- Links to I-INCE technical activities and I-INCE Technical Reports

INCE/USA and Related Activities

The Institute of Noise Control Engineering of the United States of America has 41 Distinguished International Members from 18 countries. The honorary status of Distinguished International Member is conferred by the INCE/USA Board of Directors upon eminent acousticians who reside outside the U.S.A. Our Distinguished International Members are listed below. Members who have passed away are maintained on our list to continue acknowledging their important contributions to our profession. They are also proudly displayed on our website at:

http://www.inceusa.org/links/Awards%20History%202012.pdf

Citizens of countries other than the U.S.A., and who do not reside in the U.S.A., may be elected Distinguished International Members if they personally have made identifiable, significant contributions to the theory and/or practice of noise control engineering, which usually includes contributions to the literature of the field.

I-INCE member societies may nominate outstanding individuals for consideration as Distinguished International Members of INCE/USA. Nominations may be submitted by a committee of peers who are active in noise control engineering in the country of the proposed nominee. For each nomination, a brief resume of professional accomplishments (typically one page in length) is to be included with the nomination.

An important criterion in the nomination of individuals for election as a Distinguished International Member is evidence of superior professional stature in their own country. Factors which are considered to contribute significantly to this attribute are recognition by technical peers through awards and honors as well as contributions to engineering activities related to noise control in academe, industry or government.

Nominations may be forwarded to me at the email address below. I will arrange to present nominations to the Board of Directors of INCE/USA for their consideration and election. Payment of an annual membership fees is no longer required for this honorary position in INCE/USA. It is now voluntary.

Eric W. Wood
INCE/USA President
INCE Foundation President
ewood@acentech.com

DISTINGUISHED INTERNATIONAL MEMBERS OF INCE/USA

Australia
Louis Challis
Fergus Fricke
Colin Hansen
Leonard Koss

Austria
Judith Lang

Belgium
Gerrit Vermeir

Brazil
Samir N. Y. Gerges

Canada
Gilles Daigle
Michael Stinson
Tony Embleton

Czech Republic
Josef Novák

Denmark
Birger Plovsing

Finland
Kari Pesonen

France
Michael Bockhoff
Daniel Commins
Jean Mattei

Germany
Ulrich J. Kurze
Joachim Scheuren
Brigitte Schulte-Fortkamp
Werner Schirmer

Hungary
Andras Kotschy
András Illényi

India
M. Munjal

Japan
Zyun Iti Maekawa
Seiichiro Namba
Toshio Sone

The Netherlands
Jan Granneman
Tjeert ten Wolde

Portugal
Jorge Patrício

Russia
Vyacheslav Maslov

Sweden
Tor Kihlman
Conny Larsson
Nils-Åke Nilsson
Juha Plunt
Sten Ljunggren
Ulf Sandberg

United Kingdom
Jeremy Astley
Bernard Berry
Frank Fahy
John Ffowcs-Williams
Hugh Jones
H. Leventhall
A. Middleton
Philip Nelson

INCE-USA Announces a New Team to Manage the INCE-USA Business

James K. Thompson, PhD, PE
NNI Managing Editor

During the last few months INCE-USA has made an important transition. For the past 4 years Raybourn Group International (RGI) has served as the INCE-USA business office and has provided excellent support of INCE members and activities. However, toward the end of 2012, it became clear that INCE-USA and RGI did not agree on future directions for our relationship. It was agreed that INCE-USA would seek a new agency and that RGI would continue to support the institute until this process was completed. Thanks to the hard work of Joe Cuschieri, Eric Wood, Deane Jaeger, Steve Hambric, Rich Peppin, and Jim Thompson, a new agency was selected and the transition to this new company has been completed with the new team officially starting on April 1. We want to thank RGI for their many years of support and professionalism through this transition.

The new INCE Business Office (IBO) is now under the management of Frontline Association Management Inc. They are located in Springfield, Illinois, so you may see a different address on INCE correspondence. There have been extensive discussions with Frontline, and I am convinced they are an excellent fit for our institute. They bring a wealth of experience, enthusiasm, and professionalism that will be an asset for us. The primary point of contact at Frontline for INCE-USA will be Suzanne Baase. You can reach Suzanne at 217.528.9945 or ibo@inceusa.org. Ms. Baase serves as a Senior Account Executive and supports a number of entities like INCE. She also leads Frontline's Information Technology & Processes Team. She brings to INCE a great deal of experience and impressive technical skills and knowledge. Having been involved in several discussions with Suzanne and Kim Robinson, CAE, the President of Frontline, I feel confident that they will provide excellent service and support to all INCE members.

Among the many factors that lead to the selection of Frontline from the 14 companies that applied to serve as IBO were three items that stood out to the search committee. First, their philosophy of how an institute like ours should operate and where the focus of attention should be was a match to that of the INCE Board of Directors.

The next most important factor was the technology that Frontline will bring to the institute. They have demonstrated the ability to integrate the various member, conference, publications, and other databases of INCE to provide a comprehensive solution. This will not only make the day-to-day operations more efficient, but it will also provide better service to the members. In the future when a member wishes to register for the conference, he/she will simply go to the INCE website and click a registration tab. The site will know his/her member information and help fill out the registration forms. Discounts or special offers for members will automatically be provided. This technology will facilitate better and new services for all members.

The final factor in the selection of Frontline was the staff. Before making our selection, a team visited Frontline and spent nearly a day discussing INCE, Frontline, and how we could work together. We all came away very positively impressed.

If you get the opportunity, please welcome Suzanne and the Frontline team aboard. I am confident that you will find them to be supportive and professional. I look forward to working with them and hope each member has as positive experience as I have had.

ProAcústica

Pro Acústica | Associação Brasileira para a Qualidade Acústica

ProAcústica – the Brazilian Association for the Acoustical Quality – is a not-for-profit organization whose goal is to gather together companies and professionals to develop the field of Applied Acoustics and Vibration Science in Brazil. The organization is based in Sao Paulo, Brazil.

ProAcústica was created in June/2011 by the initiative of companies and professionals who identified the opportunity to disclose to society the importance of acoustic quality in buildings and in the environment as a factor of well-being and public health.

Our strategic guidelines aim at a greater interaction and continuous alignment with our members; the consolidation in the civil construction and acoustic markets; the ongoing establishment of action plans, support programs and promotion of selected content to different audiences; and the consolidation of sector-based partnerships with other organizations, governments and society.

The Mission of the association is promoting and communicating the importance of good techniques and acoustic quality in buildings and in the environment as a factor of well-being and health for society and the Vision is transforming our entity into a benchmark and taking proactive actions to define and announce best practices in acoustic solutions.

The Membership Categories are Founders, Honorary Founders, Honorary Members and Members. Members are companies or professionals characterized by: Construction companies and builders; Installation and distribution companies; Manufacturers of acoustic products; Engineering and architecture firms; Laboratories; Liberal professionals (individual member) and Acoustic consultants and designers.

PRO ACOUSTICA OFFICERS

Davi Akkerman | President (presidencia@proacustica.org.br)
Alberto Safra | Financial Administrative Vice-President
Carlos Eduardo Ferreira | Technical Activities Vice-President
Francisco Carlos Munhoz | Associative Resources Vice-President
Günter Michael Leitner | Market Relations Vice-President
Luciano Nakad Marcolino | Communications and Marketing Vice-President

Maria Elisa Miranda | Manager (gerencia@proacustica.org.br)

MEMBERSHIP AT A GLANCE

56 Companies & professionals
12 x Acoustic project and consulting
01 x Architecture and engineering offices
09 x Company of installation and distribution
01 x Constructor and real estate developer
26 x Manufacturer of acoustic products
07 x Professional (individual member)

website: www.proacustica.org.br
Phone: 55.11.5041-3036
Address: Av. Ibirapuera, no. 3458 sala 1
Indianápolis
CEP 04028-003
São Paulo/SP Brasil

Member Society Profile is a regular feature of *Noise News International*. If you would like to have your society featured, please contact Jim Thompson at nnieditor@noisenewsinternational.net

Transportation noise effects on children's learning and cognition

By Charlotte Clark, CPsychol, PhD, BSc (Hons)

INTRODUCTION

The effect of environmental noise exposure on children's cognitive performance and learning outcomes has been researched since the early 1970s, with researchers trying to quantify the potential impact of environmental noise exposure at school or home on children's cognitive skills and school attainment, largely by comparing children with high noise exposure with children with lower noise exposure. To date, over 20 studies have shown a negative effect of noise on children's reading and memory skills[1], with many of these studies examining the effects of aircraft noise exposure and some studies examining road traffic noise. Recent years have seen several methodological advancements in the field including the use of larger epidemiological community samples and better characterisation of noise measurement. Evidence from longitudinal studies is beginning to emerge, and studies have started to examine exposure-effect relationships, to identify thresholds for noise effects on cognition which can be used to inform guidelines for children's noise exposure.

Contemporary studies of noise effects on children's learning typically use established metrics of external noise exposure, such as L_{Aeq16} which indicates average noise exposure in dBA over a 16 hour daytime period. Studies of noise effects on children's learning traditionally measured noise exposure or used existing noise contour maps. More recent studies model exposure using Geographical Information Systems. A few studies have also examined exposure to maximum noise levels (e.g. L_{Amax}), as it is not known whether the overall 'dose' of noise exposure is important in determining effects on children's cognition or whether peak sound pressure events or the number of noise events might be important. This issue is of increasing importance given that the number of noise events for aircraft and road traffic noise are increasing, while noise emission levels per event are falling. In the community, people are often exposed to sounds from more than one source. However, to date, studies tend to focus upon only one type of exposure such as road traffic or aircraft noise exposure, mirroring how policy formation is often divided up by source.

NOISE EFFECTS ON CHILDREN'S LEARNING

The Early Years

One of the earliest studies was carried out by Cohen, Glass & Singer in 1973[2] who examined 54 2nd, 3rd, 4th, and 5th graders who were living in 32 floor apartment blocks near the Interstate 95 in Manhattan. Noise exposure in the homes was quite high at around 84dBA outside at the base of the apartment blocks, with expressway traffic the main noise source. Initial decibel measurements permitted the use of apartment floor level as an index of noise intensity within the apartments, with noise being higher in the apartments on the lower floor levels. Children living in these apartments were tested for auditory discrimination and reading comprehension. Children living on the lower floors, (i.e. exposed to higher noise levels) showed poorer auditory discrimination and reading comprehension than children living on the higher floors. When studying the relationship between noise exposure and cognition, it is important to take socioeconomic factors into account, as children with greater socioeconomic disadvantage are generally more likely to be exposed to noise and also to perform more poorly on tests of cognitive ability. In Cohen, Glass, & Singer's study, accounting for social class reduced the size of the relationship between noise and reading.

In another naturalistic experiment, Bronzaft & McCarthy (1975)[3] compared the reading scores of elementary school children who were taught in classrooms on the noisy side of a school near a railway line [220 feet from elevated subway track] in Manhattan with the scores of the school children in classrooms on the quiet side of the same school. The average noise level when a 6th grade class was in session was 59dBA, which rose to 89 dBA when a train passed: trains passed every 4½ minutes causing a 30 second interruption to the class. The children's cognitive abilities were assessed using standardised reading achievement tests measuring word knowledge, reading comprehension, and general reading. Bronzaft & McCarthy (1975) found that children in classes on the noisy side of the school building did more poorly on the reading achievement tests than those taught on the quieter side of the school. The mean reading age of children on the noisy side of the school was 3 to 4 months behind the children in the low noise exposed classrooms in the lower grades,

and 11 months behind in the 6th grade. Bronzaft & McCarthy suggested that the larger impact for the older children may be because more of this grades' teaching was done from the front of the classroom, whereas the younger children tended to have more desk time with the teacher.

In 1978 the New York City Transit authority undertook an intervention to reduce noise near the school involved in the earlier study by Bronzaft and McCarthy (1975)[4]. The tracks closest to the school were treated to rubber pad installation, which reduced the noise from the track by about 3-4 dB and sound absorbing ceilings were also installed in three of the noisiest classrooms in the school which also reduced noise by about 3-4 dB . So overall, the intervention reduced noise by about 6-8 dB. Bronzaft examined the standardised reading achievement scores for the school for several years before and after the intervention to assess whether reading achievement scores improved after the intervention. This study confirmed that prior to the intervention those children on the noisier side of the school had lower reading scores: after the intervention no differences in reading scores for those on the quiet or noisy side of the school were found. Bronzaft suggested that the lower test scores might have been the result of lost teaching time as trains passed and also when the teacher had to redirect the students' attention after the noise has passed. Teachers reported less lost time and fewer interruptions after the insulation was installed. Bronzaft expressed surprise at the speed with which the effects on reading ability abated

after sound insulation and this remains something that we still know little about over 30 years later.

The Munich Airport Study

Another study that has examined the impact of interventions to reduce noise exposure on children's learning is the Munich Airport Study[5-7]. In 1992 the old Munich airport closed and was relocated. This longitudinal study examined the effect of the relocation of Munich airport on the cognition of children living near the 'old' and 'new' airports. Prior to relocation, high noise exposure was associated with deficits in long term memory and reading comprehension in children aged 10-11 years. However, two years after the closure of the airport, these deficits disappeared, indicating that noise effects on cognition may be reversible if exposure to the noise stops. Most convincing was the finding that deficits in memory and reading comprehension developed over the two year follow-up for children who became newly noise exposed near the new airport: deficits were also observed in speech perception for the newly noise exposed children. The Munich study is one of the few longitudinal studies in the field, providing important evidence for a cause-effect relationship between noise exposure and cognitive deficits.

How Could Noise Influence Learning?

Environmental noise might influence children's learning in several ways. One pathway is physiological stress. Acute noise exposure directly causes a number of predictable short-term physiological responses including increased blood pressure and endocrine outputs and it is proposed that chronic noise exposure may cause a longer-term activation of these responses resulting in subsequent illness, as well as influencing mood and behaviour. Children are also thought to be more vulnerable to psychological stress, as they are likely to be poorer at appraising the level of threat from stressors and also to have fewer well-developed coping strategies. Teacher frustration, interruptions in communication between teachers and children, and impaired speech perception could also be pathways for cognitive effects[8,9]. In the noisiest schools teachers may have to stop teaching while vehicles pass and if this is frequent it may contribute to interruptions in communication and fatigue in teachers and children, and to a reduction of morale and motivation in teachers. Impaired attention[2,9] has also been suggested to account for the effects: however, there is evidence from more recent studies that sustained attention is not impaired by aircraft noise[10,11] and that noise effects on cognition are not explained by impairment of attention[12]. A further mechanism is learned helplessness, which is when children do not perceive themselves to be in control of their environment[5]. In the Munich Airport Study children exposed to high levels of aircraft noise, did not persevere as long as children not exposed to noise at difficult standard puzzles, which is suggestive of learned helplessness.

Noise also causes annoyance, especially if an individual feels their activities are being disturbed or if it causes difficulties with communication. In some individuals, this annoyance may lead to stress responses. However, at present there is little evidence to directly support the annoyance pathway as a mechanism for effects on cognition. Another potential pathway is sleep disturbance caused by noise exposure at home. Sleep disturbance can impact on well-being causing annoyance, irritation, low mood, fatigue, and impaired task performance[13]. Overall few studies have examined sleep disturbance as an explanation for noise effects on cognitive performance. One study found that self-reported sleep disturbance did not explain the association of aircraft noise exposure and cognitive impairment in children[14] but studies have yet to examine objective assessments of sleep disturbance. Overall, several plausible pathways and mechanisms for the effects of noise on children's cognition have been put forward, but in general evidence for these mechanisms is fairly sparse.

Exposure-Effect Relationships

Whilst by the end of the 1990s several studies had demonstrated effects of noise exposure on children's cognition and learning, there were significant limitations to the evidence base. Little knowledge about exposure-effect relationships between noise and children's cognition was available, as studies had tended to compare the performance of children in high noise exposure with children in low

noise exposure: thus limiting the range of noise exposures examined. The decibel level used to define those children in the 'noise exposed' group differed between studies, which meant that we could not be certain about at what noise level effects on cognition might begin. Are there thresholds for effects? To inform policy, it was necessary to study a wider range of noise exposures, so that exposure-effect relationships could be examined.

The first exposure-effect study was carried out by Green and colleagues[15] in New York, relating noise exposure scores (based on noise exposure forecast contours for New York City Airports) to the percentage of students reading below grade level between 1972 and 1976 in all elementary schools in Brooklyn and Queens. Social disadvantage was adjusted for in terms of the percentage eligible for free lunch programmes, along with adjustment for ethnic group and other school data. They found an exposure-effect relationship: so as aircraft noise exposure at the school increased, performance on the reading test decreased. A one unit increase in noise score was associated with a 0.62% increase in the number of students reading one or more years below grade level in the average school. This meant that an additional 3.6% (95% CI 1.5-5.8%) of the students in the noisiest schools read at least 1 year below grade level compared with the quietest schools. This study was very much ahead of its time and another exposure-effect study was not conducted until the early 2000's[10].

The RANCH Study

The European Union funded RANCH study (Road traffic and Aircraft Noise exposure and children's Cognition and Health)[10, 16], compared the effect of aircraft noise and road traffic noise on the cognition and health over two thousand 9-10 year old children attending 89 schools around three major airports in the Netherlands (Schiphol Amsterdam), Spain (Barajas, Madrid) and the UK (Heathrow London). This is the largest study of its type to date; was the first study to derive exposure-effect associations for a range of cognitive and health outcomes; and was the first to compare the size of the effect of noise exposure on cognition and health outcomes across countries.

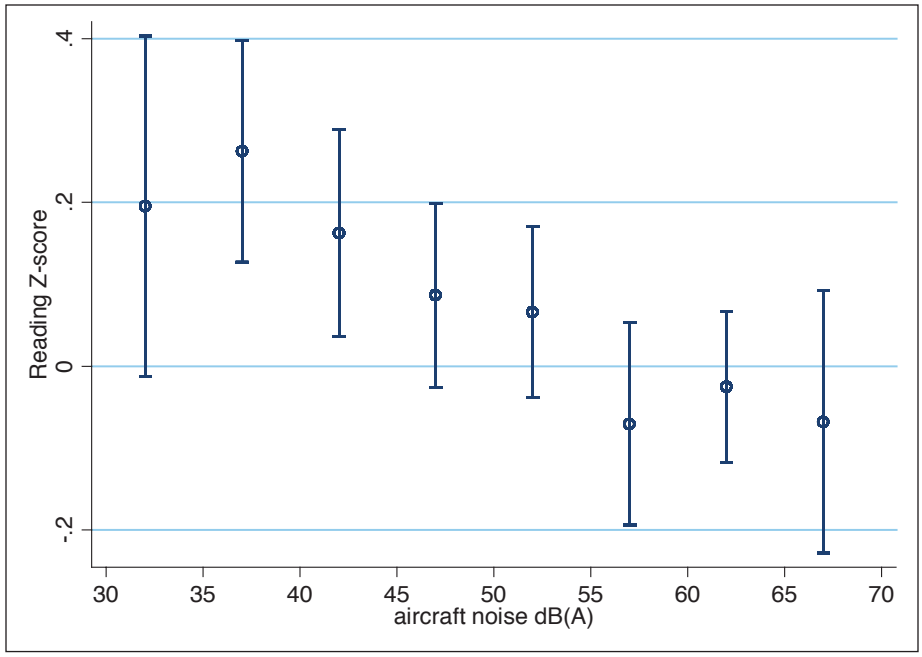


Figure 1: RANCH study adjusted mean reading Z score (95% Confidence Intervals) for 5 dBA bands of annual aircraft noise exposure at school (adjusted for age, sex and country) [10, 16]. [NB: reading comprehension was measured using a z-score which has a mean score of 0 and a standard deviation of 1]

Schools were selected from across a range of aircraft and road traffic noise exposures from high to low and were also matched within countries for socioeconomic status. In all three countries, aircraft noise estimates were based on 16-hour outdoor L_{Aeq} contours which gave the average continuous equivalent sound level of aircraft noise in an area from 7 a.m. to 11 p.m. for a specified period (usually a year). In the Netherlands, estimates of outdoor road traffic noise were provided by modelled data. In the United Kingdom and Spain, estimates of road traffic noise at school were based on a combination of modelling the proximity to motorways, major roads, and minor roads; traffic flow data; and noise measurements taken at the façade of the school building. In all countries, acute noise measurements were taken both inside and outside the classroom during testing.

Reading comprehension was assessed using standardised measures in each country. Children's short-term, long-term, and recognition memory, as well as attention skills were assessed using the same tests across the countries, administered in the classroom. Parents and children also completed questionnaires to obtain information about socioeconomic and demographic factors, health, and noise annoyance.

The RANCH study found a linear exposure-effect relationship between chronic aircraft noise exposure and poorer reading comprehension and recognition memory, after taking a range of socioeconomic and confounding factors into account including mother's education, long-standing illness, the extent of classroom insulation against noise, and acute noise during testing[10]. As aircraft noise exposure at school increased performance on the reading

test decreased. In terms of the magnitude of the effect of aircraft noise on reading comprehension, a 5 dB L_{Aeq16} increase in aircraft noise exposure was associated with a 2 month delay in reading age in the UK and a 1 month delay in the Netherlands[16]. Reading age could not be calculated for the Spanish test.

No relationships were found between chronic road traffic noise exposure and cognition, with the exception of long-term memory, which surprisingly showed better performance in high road traffic noise areas. This finding was unexpected but may be explained the arousal hypothesis: noise can increase arousal and arousal can improve performance on simple tests. In the RANCH project, the highest road traffic noise exposure at school was 71 dB L_{Aeq16} and it is possible that road traffic noise may influence children's cognition and health at higher levels. For both aircraft and road traffic noise, the relationships found did not differ across the three countries, therefore supporting the notion that guidelines and policies setting external noise limits for children could be applied across Europe.

Importantly, the RANCH study contributed exposure-effect relationships for aircraft and road traffic noise and a range of cognitive outcomes, that made it possible to start to quantify the magnitude of noise induced impairments on children's cognition. Figure 1 shows the exposure-effect association between aircraft noise exposure and reading comprehension in the RANCH study, which can be used to guide decision making by stakeholders and policy makers, as well as to estimate the benefits of noise reduction. This figure indicates that reading falls below average (a z-score of 0) at exposures greater than 55 dB(A): however, as the relationship between aircraft noise and reading comprehension was linear, reducing exposure at any level should lead to improvements in reading comprehension. In contrast, a curvilinear relationship is found between aircraft noise exposure and children's noise annoyance: there was an exponential increase in annoyance at higher levels of aircraft noise exposure that begins at around 55 dB L_{Aeq16}.

Another conclusion of the RANCH study was that whilst aircraft noise has only a small effect on reading comprehension, it was possible that children may be exposed to aircraft noise for many of their childhood years and the consequences of long-term noise exposure on reading comprehension and further cognitive development were not known. A six-year follow-up of the UK RANCH sample was recently undertaken to examine the long-term effects of aircraft noise exposure at primary school on children's reading comprehension[17]. The study found that children who were exposed to aircraft noise in primary school had increased noise annoyance at follow-up but only slightly poorer reading comprehension. This is the first longitudinal study to assess the long-term consequences of noise exposure during primary school for cognitive development and health. Aircraft noise exposure at primary school might impair later reading comprehension, as well as increase noise annoyance in children.

The RANCH study has proved an important resource within this field of research. A further publication found that night-time aircraft noise at the child's home was also associated with poorer reading comprehension and recognition memory, but that night-noise did not have an additional effect to that of daytime noise exposure [14]. Further publications have also examined the role of air pollution on the associations between noise exposure and cognition, finding that the relationships between noise and cognition are not explained by co-occurring air pollution[18, 19].

Classroom Acoustics

All of the studies reviewed so far focus on external noise exposure in the home or school environment. But what about the interplay between external noise exposure at school and the internal noise within the child's classroom that comes from the children, teaching activities, and ventilation? What role do internal classroom acoustics play in the relationships found between external environmental noise and children's cognition?

Only a few years ago, Lubman & Sutherland [20] suggested that there was lack of knowledge about the educational impact of poor school acoustics. The past few years have seen the publication of several papers examining the role of classroom acoustics in noise effects on cognition[21-28]. These studies focus upon noise interference with verbal communication as the mechanism for the effect: with some studies describing the acoustic characteristics of classrooms, some specifically assessing speech intelligibility, and a few linking acoustic conditions to performance outcomes.

Several studies have focused on the effects of noise levels, reverberation times, and the speech-to-noise ratio on speech intelligibility within classrooms[25, 26, 29-32]. A review of the field, suggests that younger children require quieter conditions for optimum speech intelligibility, leading the authors to suggest that students aged 6-7 years would require maximum ambient sound levels in occupied classrooms of 28.5 dBA, rising to 34.5 dBA for 8-9 year olds, to 39 dBA for 10-11 year olds, and to 40 dBA for students aged 12 years or older[30]. Picard and Bradley also concluded that reverberation time was less important than sound levels, with $RT_{1\,kHz}$ around 0.5 s being optimum in occupied classrooms: along with speech-to-noise ratios of 15dBA. However, as argued by Picard and Bradley, noise

levels in classrooms are often in excess of these optimum conditions leading to problems with speech perception. A recent US study found that ambient noise levels in unoccupied classrooms ranged between 38 and 55 dBA and that occupied reverberation times ranged between 0.3 to 1.1 s [33]. A study of occupied Canadian elementary school classrooms found that on average students experienced sound levels of 49.1 dBA, teacher speech levels of 60.4 dBA, and a mean speech-to-noise ratio of 11 dBA during teaching activities[26].

A recent further study has confirmed relationships between both external and internal noise exposure at school and the results of national tests for children aged 7-11 years attending London primary schools[22]. External noise showed a larger effect on the performance of older children and L_{Amax} showed the strongest association with test scores, suggesting that individual noise events may play an important role on cognitive effects. The latter finding is also supported by another study which found that pupil's subjective assessments of noise disturbance and noise intensity showed a stronger relationship with L_{Amax} than with L_{Aeq} or L_{A90} noise measurements[27]. Astolfi & Pellerey concluded that pupils seem to be disturbed more by intermittent loud noises than by constant noise.

Guidelines for Children's Noise Exposure

Several guidelines for both internal and external noise exposure at children's schools have been proposed in recent years in the US and Europe. The majority of these are guidelines which are not statutory and most specify noise limits for ambient environmental noise, rather than specifying limits for specific noise sources such as aircraft or road traffic noise. One of the most influential set of guidelines tackling the effects of noise exposure on human health are the World Health Organisation (WHO) Community

Noise Guidelines[34]. These international guidelines specify that for pre-school and school classrooms, internal sound levels should not exceed 35 dB L_{Aeq} during class time and that outdoor levels in school playgrounds should not exceed 55 dB L_{Aeq} during play. These guidelines are often cited, but are felt by many acousticians to be unachievable, given the extremely low level of sound specified for occupied classrooms.

The American National Standards Institute (ANSI) specified a standard for school acoustics in 2002 (ANSI S12.50-2002)[35], which again is voluntary not mandatory. The standard specifies a 35 dBA internal background noise limit for unoccupied classrooms: this level was chosen to achieve a minimum 15dB speech-to-noise ratio at the back of the classroom. The standard also specifies a 0.6 s reverberation time for classrooms < 283m^3, rising to 0.7 s for classrooms > 283m^3 to 566m^3 and that intermittent noise should not exceed 40 dBA. The ANSI standard is supported by the Acoustical Society of America and INCE-USA[20] and it is estimated that two-thirds of American classrooms fail to meet the specified 35 dBA background noise limit[20]. Whilst the WHO and the ANSI guidelines both specify a maximum sound level of 35 dBA, it should be noted that for ANSI guidelines this is for unoccupied classrooms, whilst for the WHO guidelines this is for occupied classrooms.

There are no Europe-wide guidelines for children's noise exposure. However, many European countries (e.g. Sweden, the UK, Germany, and the Netherlands) have issued guidance on safe levels for noise exposure outside and inside schools. Within Europe, the recommended external environmental noise level for schools range from 50 – 60 L_{Aeq} dB. However, the recommended levels for external noise exposure are guidelines which cannot be mandated. Standards for classroom acoustics are also available in some European countries. For example, in the UK Building Bulletin 93 (BB93) which governs the acoustical design on newly built schools and school building extensions[36] stipulates that in unoccupied primary and secondary school classrooms internal ambient noise levels should not exceed 35 dB $L_{Aeq,\ 30\ min}$. Reverberation times should not exceed 0.6 s and 0.8s for primary and secondary school classrooms, respectively. These regulations are compulsory for new school buildings.

FUTURE RESEARCH DIRECTIONS

The European Network on Noise & Health (ENNAH) recently published recommendations for future research needs in the field of noise effects on cognition[37]. Some of these recommendations are described below. The recommendations suggest that to understand the causal pathways between noise exposure and cognition, and to design preventive interventions there is a need to study the associations longitudinally. The field is largely characterised by cross-sectional studies and further longitudinal studies examining the effects of persistent environmental noise exposure throughout the child's education and the long-term consequences of noise exposure for later cognitive development and educational outcomes remain of prime policy importance.

Given the growing evidence that environmental noise is related to impairment of school performance, the question of what can be done to reduce noise induced learning impairments becomes prominent. One possible solution to noise effects on children's learning is the reduction of external sound in the classroom through sound insulation. However, there has been little research testing whether sound insulation of classrooms might lessen the effects of noise on children's learning since Bronzaft's study in the early 1980s[4]. Future research needs to examine whether learning impairments related to noise can be reduced by sound insulation of the classroom in large scale studies.

Recent studies have very much relied on the established metric of average external noise exposure – $L_{Aeq\ 16\ hours}$. Whilst average exposure metrics demonstrate effects on children's learning little is known about the effect of the number of noise events or the importance of peak sound events in noise effects on children's learning. Future studies should incorporate a range of additional noise metrics and examine their associations with children's learning to explore noise characterisation in more detail.

Recent evidence of exposure-effect relationships between noise exposure and children's cognition has provided knowledge about thresholds for effects. However, further examination of exposure-effect relationships in different contexts, for different samples and vulnerable groups, and for different noise metrics remains a research priority.

REFERENCES

1. Evans G, Hygge S. Noise and performance in adults and children. In: Luxon L, Prasher D, eds. Noise and its effects. London: Whurr Publishers; 2007.
2. Cohen S, Glass DC, Singer JE. Apartment noise, auditory discrimination, and reading ability in children. *Journal of Experimental Social Psychology* 1973; **9**: 407-22.
3. Bronzaft AL, McCarthy DP. The effects of elevated train noise on reading ability. *Environment and Behavior* 1975; **7**: 517-27.
4. Bronzaft AL. The effect of a noise abatement program on reading ability. *J Environ Psychol* 1981; **1**: 215-22.
5. Evans GW, Hygge S, Bullinger M. Chronic Noise and Psychological Stress. *Psychological science* 1995; **6**(6): 333-8.
6. Evans GW, Bullinger M, Hygge S. Chronic noise exposure and physiological response: a prospective study of children living under environmental stress *Psychological science* 1998; **9**(2): 75-7.
7. Hygge S, Evans GW, Bullinger M. A prospective study of some effects of aircraft noise on cognitive performance in schoolchildren. *Psychological science* 2002; **13**(5): 469-74.
8. Cohen S, Evans GW, Krantz DS, Stokols D. Behavior, Health and Environmental Stress New York: Plenum Press; 1986.
9. Evans G, Lepore S. Non-auditory effects of noise on children: a critical review. *Children's Environments* 1993; **10**(1): 42-72.
10. Stansfeld SA, Berglund B, Clark C, et al. Aircraft and road traffic noise and children's cognition and health: a cross-national study. *Lancet* 2005; **365**(9475): 1942-9.
11. Haines MM, Stansfeld SA, Job RF, Berglund B, Head J. A follow-up study of effects of chronic aircraft noise exposure on child stress responses and cognition. *International journal of epidemiology* 2001; **30**(4): 839-45.
12. Hygge S, Boman E, Enmarker I. The effects of road traffic noise and meaningful irrelevant speech on different memory systems. *Scandinavian Journal of Psychology* 2003; **44**(1): 13-21.
13. HCN. The influence of night-time noise on sleep and health (2004/14E). The Hague: Health Council of the Netherlands, 2004.
14. Stansfeld S HS, Clark C, Alfred T. Night time aircraft noise exposure and children's cognitive performance *Noise & health* 2010; **12**(49): 255-62.
15. Green KB, Pasternack BS, Shore RE. Effects of aircraft noise on reading ability of school-age children *Archives of Environmental Health* 1982; **37**: 24-31.
16. Clark C, Martin R, van Kempen E, et al. Exposure-effect relations between aircraft and road traffic noise exposure at school and reading comprehension: the RANCH project. *American Journal of Epidemiology* 2006; **163**(1): 27-37.
17. Clark C, Stansfeld SA, Head J. The long-term effects of aircraft noise exposure on children's cognition: findings from the UK RANCH follow-up study. Proceedings of the Euronoise Conference. Edinburgh, Scotland, October 2009; 2009.
18. Clark C, Crombie R, Head J, van Kamp I, van Kempen E, Stansfeld SA. Does traffic-related air pollution explain associations of aircraft and road traffic noise exposure on children's health and cognition? A secondary analysis of the UK sample from the RANCH project. *American journal of epidemiology* 2012; **176**(4): 327-37.
19. van Kempen E, Fischer P, Janssen N, et al. Neurobehavioral effects of exposure to traffic-related air pollution and transportation noise in primary schoolchildren. *Environmental research* 2012; **115**: 18-25.
20. Lubman D, Sutherland LC. Education stakeholders and the ANSI standard for school acoustics. *Sound and Vibration* 2004; **38**(6): 12-4.
21. Shield BM, Dockrell JE. External and internal noise surveys of London primary

schools *Journal of the Acoustical Society of America* 2004; **115**: 730-8.

22. Shield BM, Dockrell JE. The effects of environmental and classroom noise on the academic attainments of primary school children *Journal of the Acoustical Society of America* 2008; **123**: 133-44.

23. Dockrell JE, Shield BM. Acoustical barriers in classrooms: the impact of noise on performance in the classroom. *British Educational Research Journal* 2006; **32**: 509-25.

24. Dockrell JE, Shield BM. Children's perceptions of their acoustic environment at school and at home. *Journal of the Acoustical Society of America* 2004; **115**: 2964-73.

25. Bradley JS, Sato H. The intelligibility of speech in elementary school classrooms. *Journal of the Acoustical Society of America* 2008; **123**(4): 2078-86.

26. Sato H, Bradley JS. Evaluation of acoustical conditions for speech communication in working elementary school classrooms. *Journal of the Acoustical Society of America* 2008; **123**(4): 2064-77.

27. Astolfi A, Pellerey F. Subjective and objective assessment of acoustical and overall environmental quality in secondary school classrooms. *Journal of the Acoustical Society of America* 2008; **123**(1): 163-73.

28. de Oliveira Nunes MF, Sattler MA. Aircraft noise perception and annoyance at schools near Salgado Filho International Airport, Brazil *Journal of Building Acoustics* 2006; **13**: 159-72.

29. Houtgast T. The effect of ambient noise on speech intelligibility in classrooms. *Applied Acoustics* 1981; **14**: 15-25.

30. Picard M, Bradley JS. Revisiting speech interference in classrooms. *International Journal of Audiology* 2001; **40**: 221-44.

31. Bradley JS. Speech intelligibility studies in classrooms *Journal of the Acoustical Society of America* 1986; **80**: 846-54.

32. Yang W, Bradley JS. Effects of room acoustics on the intelligibility of speech in classrooms for young children. *Journal of the Acoustical Society of America* 2009; **125**(2): 922-33.

33. Bowden EE, Wang LM, Bradley D. Classroom acoustics in Omaha, Nebraska: measurement and outreach. Proceedings of the Pan-American/Iberian Meeting on Acoustics. Cancun, Mexico; 2004.

34. WHO. Guidelines for community noise. Geneva: World Health Organization; 2000.

35. ANSI. Design Requirements and Guidance for Schools S12.60-2002.; 2002.

36. DfES. Building Bulletin 93: Acoustic Design of Schools. London: HMSO; 2004.

37. Lekaviciute J, Kephalopoulos S, Stansfeld SA, Clark C. ENNAH – European Network on Noise and Health. Ispra, Italy: European Commission, Joint Research Centre, Institute for Health and Consumer Protection, 2012. (see www.ennah.eu).

Open-office acoustics: history, projects, and standards

By R. Kring Herbert, Ostergaard Acoustical Associates
200 Executive Drive, West Orange, NJ 07052-3303 USA
email: kherbert@acousticalconsultant.com

Historically, open-plan offices were the realm of clerical workers. In the 1960s upgraded open-office environments were introduced for mid-level office workers. Employees in these early open offices were bothered by noise and poor speech privacy. Starting in 1969, I became involved with finding acoustical solutions. This article explains the acoustical challenges with many of the first open-office projects, looks at the acoustical systems modified, and discusses acoustical standards developed by ASTM Committee E33 concerning open-office acoustics. This is an expanded version of a paper given at InterNoise 2012.

INTRODUCTION

In the 1960s, the Quickborner Team of Hamburg, Germany brought their management concepts to North America. They introduced office landscape, an open-office concept based on free-form, non-rectangular open-office layouts that employed freestanding curved barriers with freestanding desks. This concept was described as achieving non-hierarchical and collaborative environments. I had the good fortune or luck to provide acoustical consultation on many of the original office landscapes for organizations such as Eastman Kodak and the Port Authority of New York and New Jersey (World Trade Center). Following these, I consulted on numerous open-office projects including many for Fortune 500 Companies both on a new design and remedial basis.

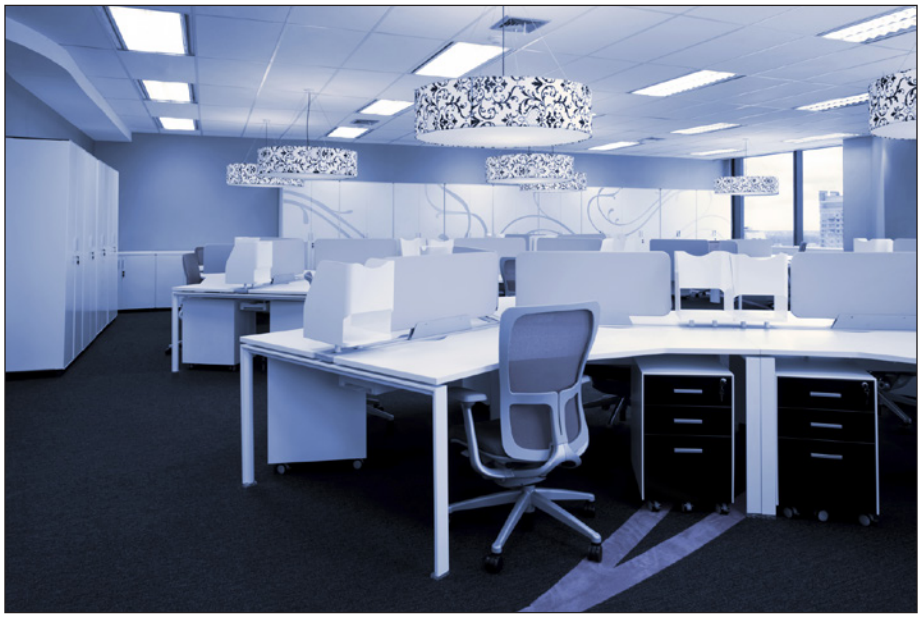
This paper discusses some early projects and acoustical solutions that were used, the development of test methods and standards relating to open plan offices by ASTM International Technical Committee E33 on Building and Environmental Acoustics, the acoustical elements that influence open office acoustical environments, and how these can be manipulated for improved conditions.

EARLY OPEN OFFICE CONSULTATIONS

Eastman Kodak was one of the first adapters of the office landscape concept. A pilot installation was built at their headquarters in Rochester, New York. It was well-received by employees, with one exception: noise/speech privacy was a problem. Kodak had done what many organizations continue to do: they took their normal office constructions, removed the walls, and installed an office landscape layout.

Kodak's normal office construction consisted of luminous ceilings comprising open egg-crate lay-in ceilings (Circlegrid), suspended below a white-painted slab with strip fluorescent lighting fixtures. There was no ceiling sound absorption to control privacy-reducing reflections off ceiling surfaces, and no masking sound system to obscure intruding speech sounds. I was not involved with the initial corrective modifications. These were engineered by a colleague at Goodfriend-Ostergaard Associates. One modification included sound-absorbent baffles suspended below and in-line with the ceiling grid. These units, manufactured by MBI, consisted of glass-fiber batts encased in white muslin. A rudimentary masking sound system was installed using a mixer modified to incorporate a noise source. Loudspeakers in metal enclosures were suspended on chains above the Circlegrid ceiling. Human resources surveys of the employees indicated that there was a perceived improvement.

It was at about this time (1970) that I took over Kodak as a client and over the subsequent two decades consulted on many new Kodak open-office projects. We started with the features of the modified pilot installation and progressively introduced acoustical improvements.



Many of these installations were at the Corporate Headquarters in Rochester as well as Kodak international offices in Madrid, London, Caracas, and Bogotá.

Looking at the modified pilot installation, the concepts were right but the specific solutions could be better. The masking system electronics were difficult to adjust or tune to achieve an optimum masking spectrum. We were essentially dealing with tone controls.

The downward-facing loudspeaker enclosures had round, solid baffles mounted on stand-offs. This arrangement was thought to direct sound horizontally in an omnidirectional pattern for more uniform coverage. This was a pipe dream. In fact the round plate acted like an acoustic lens that produced 800 Hz lobes below each enclosure. Because the ceiling was sound transparent, these lobes were quite audible. For subsequent installations we added white cellulose-spray on the overhead slab and eliminated the ceiling-mounted baffles. For later installations, we moved to glass-fiber lay-in ceilings and aimed the loudspeakers horizontally. Better masking control was developed through the use of one-third octave band equalizers. Analog noise sources were replaced with digital.

Quickborner originally used a concept that employed curved furniture screens that were thought to reflect sound back at a talker for better privacy. It did not work. We developed furniture barriers with sound-absorbent faces and centerline septums to block sound penetration.

The Port Authority of New York and New Jersey planned on moving the majority of their offices to their new development in lower Manhattan. Because they were interested in employing the office landscape concept, Goodfriend-Ostergaard Associates services were retained and I became the project manager. The Port Authority had developed a pilot office landscape in their building at 18th Street and 8th Avenue and were planning new offices to occupy the 56th through 73rd floors at One World Trade Center. About this time I joined Paul Ostergaard at Ostergaard Acoustical Associates.

The World Trade Center was being designed by Minoru Yamasaki on a 1-meter (40-inch) module so that three column bays would facilitate a 3-meter (10-foot) office. The project-standard ceiling boards comprised Armstrong Travertone tiles of custom size, 50-cm (20-inches) square, two per building module. With a noise-reduction coefficient (NRC) of 0.70, these were not sufficiently sound absorbent for the planned Port Authority open offices. As a consequence, we suggested two alternatives, supplemental acoustical baffles below the ceilings or use of nubby glass-cloth-faced glass fiber lay-in ceiling panels.

DEVELOPMENT OF THE ARTICULATION-INDEX TEST METHOD

As part of our consulting on open-office acoustics, I felt that there was a need to be able to test speech privacy in completed installations as well as in mock-ups of open offices prior to construction. I developed a procedure for measuring the noise reduction between open offices and then calculating the articulation-index values for different speech efforts. The

method was based on the concepts and one-third octave weighting factors given in ANSI S3.5-1969, *"Method for the Calculation of Articulation Index."* For speech levels, we used the male voice spectrum developed by Bolt Beranek and Newman and documented in the U.S. Department of Commerce Report PB-270053, May 1977. The male voice spectrum was selected because the results were more conservative than for the female voice. Although the test method was relatively straightforward, a number of challenges had to be solved to achieve reliable results.

The procedure called for the measurement of noise reduction between two locations, typically in adjacent workstations. However, the source levels could not be measured in the test environment. This was because path phenomena, such as sound reflected off a desk, would skew the source sound levels. The solution was to pre-measure source levels off-site in an anechoic or acoustically similar environment. Assuming no damage to the loudspeaker source, the amplifier output voltage could be measured, prior to testing, to verify the reliability of the source levels.

Since we wanted to replicate a human talker, a speech-directional loudspeaker was needed. For this, I was helped by Radio Speakers of Canada. They developed a small cabinet with two 4-inch loudspeakers aimed about 30˚ horizontally from the centerline.

We were able to use this method to evaluate mock-up offices for the Decker Engineering Building at Corning Glass Works and the T. Easton offices in Toronto, and for evaluating existing installations at Eastman Kodak, IBM, and John Hancock. The paper "Use of the Articulation Index to Evaluate Acoustic Privacy in the Open Office" was published in the September-October 1978 issue of Noise Control Engineering. It described the test method and was later used to develop ASTM E1130 "Standard Test Method for Objective Measurement of Speech Privacy in Open-Plan Spaces Using Articulation Index. "

Articulation Index (AI) is a measure of speech intelligibility that is equivalent to a percentage scale. In open offices, the goal is speech privacy, or low AI values. A paper prepared by W. J. Cavanaugh, W. R. Farrell, P. W. Hirtle, and B. G. Waters, "Speech Privacy in Buildings", documents that confidential privacy occurs with AI values of 0.05 and lower. A confidential privacy condition exists when so few words can be understood that a listener cannot determine what is being said.

Since confidential privacy is seldom feasible between adjacent workstations in open offices, and not necessarily needed, two other privacy ranges were developed: normal privacy and minimal privacy. I describe normal privacy, which covers the AI range between 0.05 and 0.20, as providing a high degree of speech privacy and control of intruding noise. However, under a normal privacy condition, with concentration, a listener can understand intruding speech. Minimal privacy only reduces the audibility of intruding noise.

Even today, some acousticians and most facilities managers are surprised to learn that the degree of speech privacy available in an open-office can be predicted or measured.

ASTM COMMITTEE E33

ASTM International is a standards-writing organization. It has been serving government and industry with the development of consensus standards for over a century. In the 1970s, ASTM Technical Committee E33 on acoustics started an effort concerning open-plan office acoustics. The initial effort was the preparation of a white paper "Acoustical Environment in the Open-Plan Office" which was published in ASTM Standardization News in 1976. The white paper was prepared by an ASTM Task Group headed by David A. Harris and included Steven M. Brown, Angelo J. Campanella, Richard N. Hamme, A.C.C. Warnock, and others. The white paper sparked my interest in participating in E33 activities and I became a member. As I remember it, there were three task groups developing two separate standards for laboratory measurement of ceilings and screens/wall panels, as well as a standard guide that would further develop the kinds of educational materials in the white paper. This would eventually become E1374 "Standard Guide for Open Office Acoustics and Applicable ASTM Standards."

Since the open-plan office acoustics activity in E33 was spread out over a number of subcommittees, consolidation seemed logical. In 1984 I went to the E33 Executive Committee and requested that a new subcommittee be authorized to consolidate open-office efforts. ASTM Subcommittee E33.02 on Open-Plan Spaces was created and, since no good deed goes unpunished, I was made the Chairman. One of my first acts was to appoint a new task group chairman, Howard Kingsbury of Penn State, to foster the Open Office Guide into final form. It was completed in 1990 and became Standard Guide E1374.

I was interested in having the method I developed for measuring articulation index in open offices converted into a standard test method. With the help of my partner, Edward M. Clark, we drafted "Standard Test Method for Objective Measurement of Speech Privacy in Open Plan Spaces Using Articulation Index" which was ratified in 1986 and designated ASTM E1130.

In 2006, I moved to Chairman of the main E33 committee and stayed for the maximum of six years. I then returned to chairing E33.02 in 2012. While I was

Chairman of E33, Robert Hallman of Armstrong World Industries ably chaired Sub-Committee 02. Bob is currently the Chairman of E33. At my suggestion, E33 modified the name of Subcommittee E33.02 from "Open-Plan Spaces" to "Speech Privacy." The reason for the name change was that new standards were under development that address closed-plan offices. These standards-writing efforts belong under the 02 umbrella because these relate to speech privacy. An example is Test Method E2638 to measure speech privacy between closed rooms.

A SYSTEMATIC LOOK AT OPEN-OFFICE ACOUSTICS

Open-office acoustical design is much more challenging than closed-office design. The primary reason is that it is not feasible to achieve a high degree of sound isolation between workstations since speech sounds refract over and around furniture barriers and reflect off walls and ceilings. Despite these limitations, it is feasible to improve sound isolation between workstations with effective furniture barriers, acoustically sensitive workstation layouts, and sound-absorbent wall and ceiling finishes that reduce the transfer of reflected speech energy between workstations. The audibility of intruding sounds is strongly affected by the masking provided by background sound.

The acoustical system of open-office environments is best viewed using the classic SOURCE-PATH-RECEIVER model. The primary sources are people talking. If lower voice effort can be encouraged, the occupants of nearby workstations will experience better privacy and less intrusive noise. Although there are limited ways to reduce speech effort, there is evidence that reduced lighting levels results in lower voice effort. Also, because speech is directional, the furniture layout may be useful in orienting talkers away from nearby listeners for a perception of better privacy. Modifications to the path and the receiver are the most powerful tools. The concept is to reduce the level of speech sounds reaching listeners. First, block the direct path between the sources (talkers) and the receivers (listeners). Second, sound reflections off ceiling, floor, wall, and furniture surfaces need to be controlled with sound absorption or some method of diffusion.

All paths need to be controlled because the sounds that reach the receiver via a variety of paths merge to make one coherent sound image. The path that allows the most speech energy to pass often controls the degree of privacy. Consequently, it is important in designing an open-office environment that upgrading one element, say the ceiling, while allowing low screens, may help with the general noise level, but does little to improve privacy between adjacent workstations.

Since the very openness of open-office environments limits path noise reduction, it is important to reduce the audibility of intruding speech sounds for listeners. This is achieved with background sound tailored to improve privacy, while being neither an annoyance nor inducing talkers to elevate their voice level. If done properly, artificially-generated background sound can significantly contribute to privacy. I will discuss each of these tools.

Ceilings

Ceilings are the most acoustically-critical surfaces in open offices because of their potential to reflect source sounds to all adjacent workstations. Ceiling characteristics that can reduce the detrimental impact of these reflections include sound absorption, diffusion, and increased height.

Richard Hamme of Geiger and Hamme developed a number of open-office acoustical metrics and test methods for the United States General Services Administration. Hamme's laboratory test environment included a ceiling, walls, and a furniture barrier. All of these constructions were made highly sound absorbent except for the test specimen, which might be a ceiling, furniture barrier, or wall finish. ASTM E33.02 members were also interested in developing test methods to evaluate these open-office components. It was thought that Hamme's test environment, which mimicked an open office, was the correct approach. However, a different single-number metric was developed by E33 and called articulation class (AC), which is an AI-weighted noise-reduction value. It is based on the work of A. C. C. Warnock at the National Research Council of Canada. The interzone attenuation is the noise reduction between a source and a receiver location on either side of a furniture barrier. Values are measured over the 200-to-5,000 Hz one-third octave band range.

The initial component test method developed by E33 was E1111, "Standard Test Method for Measuring the Interzone Attenuation of Ceiling Systems." Also developed were E1375, "Standard Test Method for Measuring the Interzone Attenuation of Furniture Panels used as Acoustical Barriers," and E1376, "Standard Test Method for Measuring the Interzone Attenuation of Sound Reflected by Wall Finishes and Furniture Panels." In 2004 the three test methods, which had many characteristics in common, were combined into E1111 and the standard's name was changed to "Standard Test Method for Measuring the Interzone Attenuation of Open Office Components."

For the specifics of the test configurations please look at the standards. They have in common that the source loudspeaker is located 1.83 meters (6 feet) from the barrier. Levels on the receiving side are measured on a survey line perpendicular to the barrier starting 0.30 meters (12 inches) from the receiver side of the

barrier. Receiver levels are measured at 30.5 centimeters (12 inch) intervals. Articulation class, the single number classification, is calculated according to E1110 for each receiver distance. First, interzone attenuation values are calculated for each receiver position. What are called nominal interzone attenuation values are calculated by averaging the values at each position with the values to either side. The nominal interzone attenuation values are then weighted according to the tabulated values given in E1110 and summed.

If you review the published AC values for high-performance ceilings, you will find that these range between 180 and 220. The final zero was added over concern that there might be confusion with Hamme's "NIC Prime" metric that he developed for the GSA. If you remove the zero, you will have the AI-weighted noise reduction in decibels.

One of the serious challenges in achieving a consistent degree of open-office speech privacy is sound reflecting from ceiling light fixtures. Although ceiling reflections can be controlled with highly sound absorbent finishes, such as certain glass fiber boards, the acrylic-lensed fluorescent fixtures, commonly used in the 1970s, provided mirror-like reflections that significantly reduced privacy, especially when located in the "offending region" midway between workstations. We carried out AI testing in office mockups to evaluate methods to control these reflections. Approaches tested included perforated fixture lenses and use of sound-absorbent baffles. Deep-cell parabolic light fixtures subsequently became available, which provided better light quality, required less power, and minimized sound reflection problems. More recently a range of pendant light fixtures have become popular. Using perforations or convex faces, these fixtures produce few detrimental sound reflections and allow virtually the entire ceiling surface to be sound absorbent.

When testing a ceiling assembly, diffraction over the 1.5 meter (60-inch) barrier has an influence on the outcome. Consequently, I suggested adding another barrier height to the standard, which was done. I am unaware of tests using the higher barrier being carried out.

Vertical Building Surfaces

Wall and window surfaces, like ceilings, can be a source of privacy-reducing reflections. Reflections from blank walls are readily controlled with sound absorbent wall panels covering the surface. Whether or not such acoustical treatments are required depends on the needed degree of privacy and whether the surface will provide direct reflections between adjacent workstations.

Glazed exterior walls are a bit more challenging since, not surprisingly, workers object to having their views obstructed. Depending on the project, we developed a number of project-specific controls for window reflections.

Sheer glass curtains that could be extended by individuals were used at Educational Testing Services. The choice was between reduced privacy or vision.

For the John Hancock Tower in Boston we were retained to evaluate their very real privacy concerns. We developed baffles that were perpendicular to the glass and in-line with mullions. The baffles, which filled the gap above low perimeter induction units, were a continuation of the furniture barriers between workstations. The baffles were constructed to have sound-absorbent surfaces and act as acoustical barriers.

For the Port Authority floors in the World Trade Center the 1 meter (40-inch) column spacing allowed furniture barriers to abut the columns. Sound-absorbent panels were placed on the column faces and glass curtains were also provided.

Laboratory testing of the effectiveness of vertical surface treatments is covered in ASTM E1111.

Furniture Barriers

Various forms of furniture barriers are needed to block line-of-sight between personnel in adjacent workstations. Such barriers should provide reasonable insertion-loss values in the primary speech frequency range. These constructions also need to absorb surface sound reflections in a similar fashion to wall surfaces. Laboratory testing of the effectiveness of furniture barriers is covered in ASTM E1111.

Masking Sound

Providing controlled background sound to mask intruding speech sounds is a critical element for achieving acoustical comfort in most open-plan offices. Exceptions might be installations with very high ceilings where the ceiling reflections are significantly dissipated by distance before reaching ears far from the source, while also blending together to provide some masking sound. Installations with high ceilings were built in Sweden and are reported to be acoustically acceptable. In North America, where ceilings are lower, artificially-produced background sound is an essential element of good open-plan office acoustics.

There is an inherent conflict between the desire for better privacy through higher masking levels and the need to minimize annoyance from overly-intrusive masking sound. To reduce this conflict, masking sound should be spatially uniform in level, have a spectrum that is suited to the specific acoustical environment, and have a very smooth frequency spectrum. In the early Eastman Kodak installation, with sound-transparent ceilings, we used a spectrum that descended 7 dB per octave above 250 Hz. Later, with more conventional lay-in ceilings, and looking at AI-weighting factors, 5 dB per octave was found to be more appropriate.

Generally the acceptable level of masking sound is between 45 and 48 dB(A). When tuning the early Kodak installations in the evening, I would think, "How can the employees stand this 48 dB(A) level?" When returning the next morning, I was amazed to find that the masking sound seemed barely audible. The presence of a moderate amount of activity noise made all the difference. In later installations we specified systems where the masking level was gradually reduced for the evening hours so it was less apparent during periods of reduced occupancy.

Electronically-generated random noise is more detectable when all loudspeakers are sent the same signal. Consequently we switched in later installations to a two-channel approach. Alternate loudspeakers were sent the signal from one of the two channels. The spectrums were identical and could be adjusted from a central location.

The tuning processes we employed remained somewhat arduous. It involved capturing the masking spectrum in one-third octave bands in a sufficient number of representative locations and then using a carefully selected "tuning location" where we established the offset in each band from the mean measured levels. We were able to adjust the spectrum at the tuning location while being assured that the target spectrum would be achieved on average.

CONCLUSIONS

- Today there is no excuse for repeating the missteps made in early open-office installations since acoustical solutions are available to office design teams. Speech privacy goals can be established and new offices can be designed to meet these goals.
- ASTM test methods are available for evaluating open-office components and systems as well as for measuring privacy in open-office mock-ups or completed installations.
- A high degree of normal privacy is achievable in an acoustically well-designed open-office where attention is paid to layout, sound-absorptive finishes, effective furniture barriers, and correctly-tailored masking sound.
- The aid of an experienced acoustical consulting team is invaluable in achieving the acoustical goals for an office installation, whether for new construction or on a corrective basis.

REFERENCES

1. ANSI S3.5-1969, "Method for the Calculation of Articulation Index," American National Standards Institute, New York, NY (1969), www.ansi.org.
2. ASTM E1110, "Standard Classification for Determination of Articulation Class," ASTM International, West Conshohocken, PA (1986), www.astm.org.
3. ASTM E1111, "Standard Test Method for Measuring the Interzone Attenuation of Ceiling Systems," ASTM International, West Conshohocken, PA (1986), www.astm.org.
4. ASTM E1130, "Standard Test Method for Objective Measurement of Speech Privacy in Open Plan Spaces Using Articulation Index," ASTM International, West Conshohocken, PA (1986), www.astm.org.
5. ASTM E1179, "Standard Specification for Sound Sources Used for Testing Open Office Components and Systems," ASTM International, West Conshohocken, PA (1987), www.astm.org.
6. ASTM E1374, "Standard Guide for Open Office Acoustics and Applicable ASTM Standards," ASTM International, West Conshohocken, PA (1990), www.astm.org.
7. ASTM E1375, "Standard Test Method for Measuring the Interzone Attenuation of Furniture Panels used as Acoustical Barriers," ASTM International, West Conshohocken, PA, (1990), www.astm.org (withdrawn 2005).
8. ASTM E1376, "Standard Test Method for Measuring the Interzone Attenuation of Sound Reflected by Wall Finishes and Furniture Panels," ASTM International, West Conshohocken, PA (1990) www.astm.org (Withdrawn 2005).
9. ASTM E1111, "Standard Test Method for Measuring the Interzone Attenuation of Open Office Components," ASTM International, West Conshohocken, PA (2004), www.astm.org.
10. ASTM E1573, "Standard Test Method for Evaluating Masking Sound in Open Offices Using A-weighted and One-Third Octave Band Sound Pressure Levels," ASTM International, West Conshohocken, PA (1993), www.astm.org.
11. ASTM E2638, "Standard Test Method for Objective Measurement of the Speech Privacy Provided by a Closed Room," ASTM International, West Conshohocken, PA (2008), www.astm.org.
12. R. K. Herbert, "Use of the Articulation Index to Evaluate Privacy in the Open Office," *Noise Control Engineering*, Vol. 11, No. 2, September-October 1978, pp. 64-67.
13. K. S. Pearsons, R. L. Bennett, and S. Fidel, "Speech Levels in Various Noise Environments," *EPA-6001-77-025, U.S. Environmental Protection Agency*, May 1977, p. 39. Available from the National Technical Information Services as No. PB-270 053.
14. W. J. Cavanaugh, W. R. Farrell, P. W. Hirtle, and B. G. Waters, "Speech Privacy in Buildings," *Journal of the Acoustical Society of America*, Vol. 34, No. 4, April 1962, pp 475-492.
15. A. C. C. Warnock, "Studies of Acoustical Parameters in Open-Plan Offices," *Journal, Acoustical Society of America*, Vol. 63, 1978, pp 832-840.

Raytheon BBN Technologies Awarded National Medal of Technology and Innovation for Acoustic Work

Raytheon BBN Technologies, the innovation arm of the defense contractor's Network Centric Systems (NCS) unit, was awarded the National Medal of Technology and Innovation Friday, in February by President Barack Obama.

The award is the highest honor the US government can give to inventors and scientists, and is in recognition of "sustained innovation through the engineering of first-of-a kind, practical systems in acoustics, signal processing, and information technology" over the course of the 65 years since Raytheon BBN was founded.

Raytheon BBN President Ed Campbell, who accepted the award, has worked at the company for more than half of the that time in nearly every area of the company, which has developed a range of technologies from packet switching, the basis of the modern Internet Protocol (IP) system to launching ARPANET, the forerunner of the Internet, to identifying flight patterns to reduce jet engine noise in residential areas.

More recently, the company developed Boomerang, an acoustic sniper location used in Iraq and Afghanistan, and a hand-held translation device called TransTalk meant to allow soldiers and aid workers to converse naturally with local people in other countries.

The company was formed as a small acoustics consulting firm in 1948 by two professors at MIT – Richard Bolt and Leo B eranek – along with a former student of Bolt's, Robert Newman, and takes its name from the last names of all three. The company was bought by Raytheon in 2009. Today it has 800 employees most of them working in the Cambridge offices.

In addition to the Raytheon BBN award, 10 individual scientists from around the country also received the National Medal of Technology and Innovation, and the National Medal of Science was presented to 12 individuals.

Source: Boston Business Journal*; Don Seiffert, Association Editor MHT. Posted February 1, 2013.*

Rajendra Singh Named ASEE's 2013 Outstanding Mechanical Engineering Educator

Mechanical Engineering Professor Rajendra Singh has been named the recipient of the 2013 Ralph Coats Roe Award by the Mechanical Engineering Division of the American Society of Engineering Educators (ASEE).The award recognizes a mechanical engineering educator who is an outstanding teacher and has made a notable contribution to the profession.

Recognized by many of his peers as an eminent educator in machine dynamics and noise and vibration control, the nomination for his award was supported by nine fellow academics from eight different universities in the United States, several of whom are themselves past recipients of the Ralph Coats Award.

In announcing the award, Kenneth W. Van Treuren, who is the ASEE ME Division Awards Chair, wrote to Raj and the nominator, "… There were many outstanding candidates this year, however, you were the top rated individual for this prestigious award … You are an inspiration and role model for all in the mechanical engineering discipline. Thank you for all that you have done over a long and distinguished career."

The citation submitted with his award nomination reads, "Professor Rajendra Singh thrives in a present-day academic role, yet is also able to meet significant learning needs of engineers who often are far off campus. His pioneering contributions include developing a case-study, team-project approach for distance learning and global education, establishing an NSF (National Science Foundation) center devoted to smart vehicle concepts, launching an innovative senior-level capstone laboratory, and creating a unique undergraduate honors program. He has effectively disseminated engineering knowledge at the intersection of dynamics, vibrations, and machine design by publishing widely, organizing technical conferences, and mentoring students. He also has provided exemplary leadership in professional societies."

Singh holds the Donald D. Glower Chair in Engineering in the College of Engineering at Ohio State and is the Director of the NSF-funded I/UCRC Smart Vehicle Concepts Center and Director of the Acoustics & Dynamics Laboratory at Ohio State. Singh has been elected to the rank of Fellow in the Acoustical Society of America, American Society of Mechanical Engineers, the Society of Automotive Engineers, and Institute of Noise Control Engineering/USA. He has published more than 400 papers, including 192 journal articles and nine edited books or special journal issues. He has received the Outstanding Distance Learning Faculty Award from General Motors, the ASEE Westinghouse Award for "Distinguished Contributions to Teaching", the Institute of Noise Control Engineering Award for Excellence in Teaching, seven faculty research awards from Ohio State's College of Engineering, and Ohio State's Harrison Faculty Award for Excellence in Engineering Education.

Singh has been a major contributor to INCE-USA and I-INCE. He currently serves as Vice President for Technical Activities of I-INCE. Much of his research and many of his students have made substantial contributions to the field of noise control engineering.

Don't Miss Events @ NoiseCon13

Tour **- Johns Manville Headquarters**
8/28 - 11a - 2p Cost: $10
Transportation & Lunch Included

New **- Women Noise Control Engineers Luncheon**
8/27 - 12p - 1p *Mattie Silks Room*

For Students

Student Lunch 8/26 - 12p - 1p
Molly Brown Room

Young Professionals Workshop
8/28 - 10a-12p *Molly Brown Room*

Add these events to your registration before check out. Already registered? Log in and add them to your registration. You will need to enter credit card info to "check out," but you will only be charged if a new item with a fee is added (i.e. Johns Manville tour).

NOISECON13 – Beyond The Noise

Every noise control engineer has August 25-28 (or even 25-30) programmed into their calendars for NoiseCon13 and the Wind Turbine Noise Conference in beautiful Denver, Colorado.

Now is the time to begin the rest of your arrangements.

THE TECHNICAL

Register. Registration is now open on the Noise-Con 2013 website. If you are presenting, papers are due by May 13, 2013. Authors must register prior to uploading their paper. You will receive a code to enter and proceed to the upload.

Upload Your Paper. Paper format and upload instructions are available on the NoiseCon13 website by clicking here. Papers will be reviewed by the Proceedings Chair for compliance and complied for distribution at the conference.

Complete Your Presentation. The schedule for the Congress will be published in late June. Instructions will follow on uploading your presentation prior to your scheduled day, however, please also bring you presentation on a USB drive as a backup.

THE JOURNEY

Reserve your hotel room. The conference venue is the Denver Marriott City Center, located in the City Center of Denver at 1701, California Street, Denver, Colorado 80202, USA. Their phone number is +1 303 297 1300/ +1 800 228 9290.

A large block of rooms has been negotiated at highly competitive rates ($179+taxes) and features a 50% saving on room internet rates. Don't forget to mention Noise-Con 2013 or the International Wind Turbine Noise 2013 Conference if you book by phone (Event number ID=10215053). You may also book your room online by following this link.

Get to the hotel. The downtown Marriott is easily reachable from Denver Airport via taxi (around $65 one way) or shuttle bus ($19 for SuperShuttle one-way), and $11 for the Bus - Route AF (one-way, leaves from Level 6 Door 605). (Note: prices might vary.)

Get Around. Downtown Denver also has a good public transportation system including the free 16th Street Mall Ride, just a few blocks from the hotel.

PLAN YOUR FUN

The Area. Denver is a fabulous city with lots of different things going on: sports, art, music, great museums, the zoo, the botanical gardens, local breweries, home to Stranahan's whiskey distillery, the home of REI and lots of shopping areas and great restaurants. Within an easy walking distance from the hotel is the LoDo area, home to restaurants, bookstores, and galleries. Also close to the hotel is Larimer Square, the Denver Performing Arts Center, and the Denver Art Museum. There are also good bus and light rail services to help you get around.

Near to Denver are great places to enjoy such as Estes Park and Rocky Mountain National Park. There is the rich history of the west which you can experience at multiple venues including the Buffalo Bill Museum in nearby Golden, Colorado; the Colorado History Museum in Denver; and a further afield at the Manitou Cliff Dwellings Museum located at the foot of Pikes Peak, about an hour and half from Denver.

At the Conference. There are two receptions in the exposition area (Colorado Ballroom) on Monday and Tuesday evenings beginning at 5:30pm. The second reception is combined with the Opening Reception for the 2013 International Wind Turbine Noise Conference.

A lunch for women working in noise control engineering will be held on Tuesday from 12:00-1:00pm in the Mattie Silks Room for those interested in networking.

The INCE Technical Chairs will host a working dinner in the Denver III Room, which includes future conference planning on Monday evening. Contact INCE Technical Committee Chairs for an invitation should you wish to help organize sessions for Noise-Con 2014.

For Your Guests. While there is no official accompanying persons program, accompanying persons may register for the conference at the rate of $150 US, which entitles them to the benefits listed below.

- Lunch on Monday, Tuesday and Wednesday which will be close to the meeting rooms, conference registration and exposition
- Entry to the Social Events in the Exhibit Hall on Monday and Tuesday evenings
- Participation in the Conference Coffee Breaks
- Attending the Plenary Sessions 8:15-9:30am, Denver Ballroom, Monday, Tuesday and Wednesday
- Attending the Exposition Monday evening through Wednesday 11am

Guests are encouraged to meet in the nice bar/coffee area on the floor above the conference meeting rooms and exposition space and plan outings together. There is also a Starbucks on the same floor as hotel registration, that is also a nice place to meet (complete with free internet access).

THE ESSENTIALS FOR DENVER

Staying Connected. The Marriott is offering half price internet access in guest rooms for the duration of the conference. WiFi will be available in public meeting areas for checking email and the like. Registrants are strongly requested not to stream video using the NoiseCon13 internet access codes.

Weather. During the month of August participants can expect an average low temperature at night of 58°F and an average high temperature during the day of 86°F. Average rainfall for Denver in August is 1.87in.

Time Zone. Denver is in the Mountain Time Zone, (East Coast Time minus 2 hours; Greenwich Mean Time minus 6 hours from March through November).

Visas. Requirements for entry into the USA from foreign destinations vary according to country. Please check with the nearest US embassy or consulate for passport and visa information. Additional information on entry visa requirements and local consulate/embassy offices can be found here.

Currency and Credit Cards.

The unit of currency is the U.S. dollar. This converter allows you to determine the value of other currencies compared with the dollar. Internationally recognized credit cards are accepted at most hotels, shops, and restaurants. You will find ATMs at banks for withdrawals of money (dollars); this works with most international bank debit (money machine withdrawal) cards.

Taxes and Tips. International travelers may not be familiar with the way taxes and tips affect price tags. Most sales are subject to a sales tax which is in addition to the tag/label price. For hotels and car rentals, there are usually additional taxes. These taxes can vary by location. Tips at restaurants are usually expected to be between 15% and 20%.

Electricity. Most hotel outlets are 110 volts AC at 60 Hz. Always check the power supply before using electrical equipment.

NoiseCon 2013 Exhibitors

ACO Pacific, Inc
acouStaCorp LLC
Acoustic Systems/ETS-Lindgren
ANV LLC
BASW Acoustic North America
Bruel & Kjaer
BSW GmbH
BSWA Technology Co., Ltd.
Casella CEL Inc.
Crystal Instruments
Damping Technologies, Inc.
Data Physics Corporation
DataKustik GmbH
Dytran Instruments, Inc.
Earthworks
Eckel Industries Inc, Acoustic Division
ECORE International / QT Sound Insulation
ESI Group
Fellert Acoustical Plaster/ SoundCoustic Walls
Free Field Technologies
G&S Acoustics
G.R.A.S. Sound and Vibration.
Getzner Werkstoffe GmbH
Gfal tech GmbH
International Cellulose Corporation
Jamison Door
Kinetics Noise Control
Krieger Specialty Products
Larson Davis
LMS North America
Mason Industries
MBI Products Company, Inc.
Microtech Gefell, GmbH
Müller-BBM VibroAkustik Systeme, Inc
Noise barriers LLC
NTI Americas Inc / NTi-Audio AG
NWAA Labs, Inc
OROS-Noise & Vibration Solutions
OverlyDoorCompany
PAC International, Inc.
Pliteq Inc
Polytec, Inc.
Pyrok,Inc.
RION Co., Ltd.
Scantek, Inc.
Sealed Air Corporation

INTERNOISE 2013 – Innsbruk, Austria

September 15-18, 2013

The INTERNOISE 2013 committee has announced the Congress the Plenary and Keynote speakers. They include:

Plenary Lectures

Marion Burgess, Research Officer School of Engineering and Information Technology The University of New South Wales, Canberra, Australia
Community Noise Management and Control: Successes and Challenges.

Otto von Estorff, Technische Universität Hamburg-Harburg, Institut für Modellierung und Berechnung,
Numerical Prediction of Noise Sources: Facts, Fears, Future

Keynote Lectures

Foort de Roo - *New EU and UN/ECE Vehicle Noise Emission Limits and Associated Measurement Methods*

Takeshi Kurita - *Reduction of External Noise From Shinkansen Trains*

Wolfgang Probst - *Prediction of Sounds and Noises for a Better Environment – Scientific and Political Aspects.*

Klaus Genuit - *The Need for Transdisciplinary Actions - Psychoacoustics, Sound Quality, Soundscape and Environmental Noise*

Kerstin Persson Waye - *Is It Possible to Achieve a Healthy Sound Environment in Hospitals?*

Marco Paviotti - *The EU Noise Policy After the Second Round of Noise Maps and Action Plans*

EXPERIENCE INNSBRUK

Congress Innsbruck is combining an international standard with Tyrolean charm. The distances are short, the layout clear and all the facilities under one roof. Above all, we attach great importance to personal service, so that every function is an occasion in itself - a real event. From classical to modern:

It was 1973, when one of the most modern conference centers in Europe was built in Innsbruck. About 20 years later it was extended almost by half. Today, following the merger with the Innsbruck Fairgrounds in 2005, even more facilities and space are available. The varied range of halls offers the right atmosphere for every occasion from 20 to 3000 guests and even more. Starting 2007 a very new location will be offered on top next to Innsbruck - congresspark igls.

GETTING TO INTERNOISE

By Plane. Innsbruck has an international airport that is primarily served by Austrian Airlines or partner airlines. Several daily flights connect Innsbruck to European airports such as Vienna or Frankfurt. There are direct international flights at certain days from London, Paris, Amsterdam, Göteborg, Rotterdam, Antwerp, Oslo and Stavanger. In addition, charter flights are available from and to a number of additional European destinations. Please check with your travel agent for options or refer to www.innsbruck-airport.com.

Intercontinental travelers normally connect via Frankfurt, Vienna or Amsterdam. As many intercontinental nonstop flights arrive in Munich, this airport may also be considered as a final destination. Transfer from Munich to Innsbruck is convenient by airport shuttle service or train (approx. 2.5 hrs transfer time) or you may rent a car at Munich and drive to Innsbruck (2 hrs drive time). To order an airport shuttle from Munich, refer to www.airport-transfer.com

By Train. Innsbruck is connected to the dense European Inter-City railway network. Therefore, fast and convenient daily trains reach Innsbruck from all over Europe. www.oebb.at
By Car. Innsbruck is connected to major

European motorways arriving from the North (Western Europe and Germany via Munich), from the South (Italy via Verona), from the West (Switzerland via Zurich) and from the east (Hungary via Vienna). This means that Innsbruck can be reached by car within a couple of hours driving from large parts of Central, Western and Eastern Europe.

ACCOMMODATIONS

Most hotels are within walking distance from the Congress & Messe Innsbruck. The rates are quoted in Euro, per room, per night, including breakfast and all taxes (except for the Basic Hotel Innsbruck – no breakfast included!).

Please note: some hotels are bookable for longer duration (see remarks at the hotel descriptions). If you wish to extend the duration of your stay beyond the 18th September in other hotels, please send us an email to internoise2013@cmi.at This e-mail address is being protected from spambots. You need JavaScript enabled to view it and we can arrange this for you individually!

Prepayment is not required. All costs have to be paid directly to the hotel. Please provide us with your credit card details to secure your booking. All amendments to your reservation have to be communicated to PCO TYROL CONGRESS in writing and might be subject to a cancellation fee. The **deadline for hotel reservation** is **August 10, 2013**. Please book your hotel accommodation as part of your online registration.

Grand Hotel Europa*****

The Grand Hotel Europa, Innsbruck's only five-star hotel, welcomes all guests with modern design double rooms and a cozy atmosphere. With its superior service quality it fits best for business travelers. TOP: The hotel offers a free shuttle service to all guests of Congress & Messe Innsbruck and the walking distance to Messe Innsbruck is only 10 minutes. The hotel is perfectly situated for sightseeing.
This hotel is bookable until 21 September 2013.
Single Room € 159,00
Double Room € 179,00

Austria Trend Hotel****

The hotel is located only 10 minutes walking distance from Messe Innsbruck and only a few minutes from numerous attractions. The atmosphere of the hotel is very comfortable and friendly and the furnishings are of high quality. With the spa, the fitness center and the garden it is a perfect place to relax.
This hotel is bookable until 21 September 2013.
Single Room € 132,00
Double Room € 172,00

Hilton Innsbruck****

The hotel is located near the historical Old-Town of Innsbruck, approximately 15 minutes walking distance from the Messe Innsbruck and numerous attractions. Many parks are near the hotel and the comfortable rooms are perfect to relax.
Single Room € 149,00
Double Room € 169,00

Hotel Schwarzer Adler****

The hotel is located close to the historical Old-City of Innsbruck, only a few minutes walking distance from numerous attractions and also from Messe Innsbruck. The hotel has a romantic atmosphere and individuality plays an important role. The spa area with all its specials is perfect to relax after a busy day.
Single Room € 138,00
Double Room € 173,00

Hotel The Penz****

The hotel is located close to the historical Old-Town of Innsbruck, only a few minutes walking distance from numerous attractions and 15 minutes from Messe Innsbruck. It is a very modern and elegant top class hotel which was opened in September 2002. The view over the mountains and also the city of Innsbruck is marvelous.
Single Room € 205,00
Double Room € 245,00

Hotel Central****

The Hotel Central combines tradition with modern comfort and a special atmosphere, directly in the heart of Innsbruck. The ideal hotel for holidays and business trips, only a few minutes walking distance from Innsbruck's Old Town, excels by its location and the special atmosphere of superior standard. A special trait of this hotel is its famous "Café Central", a typical Austrian café where you can enjoy the original Sachertorte.
Walking distance to the conference center: 10 minutes.
This hotel is bookable until 21 September 2013.
Single Room € 108,00
Double Room € 130,00

Hotel Maximilian****

The new renovated Hotel Maximilian celebrated its reopening on 17 December 2011 and is located near the historical Old-Town of Innsbruck, only a few minutes walking distance from the congress center and numerous attractions. The hotel is situated right in the middle of Down Town Innsbruck and the Tyrolean hospitality is inviting.
Double Room as Single Use € 150,00
Double Room € 165,00

Hotel Leipziger Hof****

The hotel is centrally located with a 15 minutes walking distance to Congress Innsbruck. The traditional hotel has a pleasant atmosphere with rooms comfortable and a beautiful spa center.
Single Room € 110,00
Double Room € 140,00

Hotel Goldener Adler****

The hotel is located in the historical Old-Town of Innsbruck, only 10 walking minutes from Messe Innsbruck and near numerous attractions. Hospitality is very

important in the traditional hotel and the atmosphere is very friendly. The hotel restaurant is renowned for its Tyrolean specialties.
Single Room € 92,00
Double Room as Single Use € 112,00
Double Room € 135,00

Hotel Innsbruck****

The 4-star Hotel Innsbruck is located in the Old Town of Innsbruck, along the former city walls, which makes it one of the most remarkable houses of the Tyrolean capital. The hotel has recently been generously restored and enlarged to ensure guests more comfort and facilities like a spacious reception area, a bar and restaurant. 20 new rooms have been created, as well as a free indoor swimming-pool, fitness room, steam room and sauna. Walking distance to Messe Innsbruck: approximately 10 minutes.
This hotel is bookable until 21 September 2013.
Single Room € 124,00
Double Room € 168,00

Hotel Mondschein****

The Best Western Hotel Mondschein is located close to the historical Old Town in the most famous row of houses in the city. Sights and shopping areas are only steps away. All rooms are equipped comfortably and feature private bathrooms finished in ocean blue marble and Swarovski Crystals, as well as air conditioning and wireless LAN internet access (free of charge). The hotel's own parking garage is free of charge. The friendly staff and cozy atmosphere of the hotel ensure a pleasant stay. Walking distance to Messe Innsbruck is only 15 minutes.
Single Room € 125,00
Double Room € 149,00

Hotel Neue Post****

Situated in Innsbruck's Town Center, the "Hotel Neue Post" offers all that you would expect from a First Class Hotel. Renovated business rooms and high-quality deluxe-suites are all equipped with safety deposit box, in-room Internet, satellite-TV, radio, telephone and minibar. The "Art Nouveau style" Hotel has been completely refurnished and offers you the opportunity to experience the traditions of yesteryear combined with the highest standards of comfort of the modern era. During your stay you will enjoy the hospitality and first-rate service that our returning guests have come to expect.
Single Room € 135,00
Double Room € 185,00

Hotel Ramada Innsbruck Tivoli****

Your accommodation is in one of the tallest buildings in the city with all the comforts a top three-star hotel can offer. From the terrace on the fifth floor you can enjoy the breathtaking panoramic views of the Tyrolean Mountains and the world-famous Bergisel ski-jump. Spoil yourself with your favorite drink above the rooftops of the most beautiful alpine city! The distance to Messe Innsbruck is 5 Minutes by Taxi or a few minutes more by public transport.
Single Room € 85,00
Double Room € 110,00

Hotel Tautermann***

The hotel is located close to the historical Old-Town of Innsbruck, only a few minutes walking distance from numerous attractions and 10 minutes by car to Messe Innsbruck. This tranquil location and friendly atmosphere make it an ideal choice for your stay in Innsbruck.
Single Room € 60,00
Double Room € 86,00

Hotel Weisses Kreuz***

The hotel is located in the historical old-town of Innsbruck, only a few minutes walking distance from the congress center and numerous attractions.
Double Room as Single Use € 115,00
Double Room € 115,00

Basic Hotel Innsbruck***

The hotel is centrally located in the heart of Innsbruck, only one minute walking distance to the historical old town and approximately 5 minutes to the congress venue. Most of the sights are within walking distance.
Single Room € 90,00
Double Room € 120,00
Breakfast is not included in the price.

Tours and Excursions for Accompanying Persons

The following tours have been designed especially for the Congress. All tours include the service of a professional guide. The prices indicated are based on a minimum number of 20 participants. If this number is not reached, alternative arrangements or a complete refund will be made. Numbers are limited on some tours and places will be allocated strictly in order of receipt of bookings. You can register for these tours online, when completing your registration for the conference.

The meeting point for all tours is at Congress Innsbruck – main entrance.

Monday, 16 September, 10:00 a.m. OR 1:00 p.m. City Tour & Bergisel Ski Jump

Our local tour guide first takes you on a walking tour through the charming Old Town of Innsbruck, situated next to the river Inn which gave its name to the city. Take a closer look at its numerous historical landmarks, such as the Golden Roof or the Imperial Castle. After a short bus ride, breathtaking views of Innsbruck as well as the fascination of a ski jumping venue with an Olympic past and modern architecture. Top architect Zaha Hadid designed this landmark of Innsbruck in 2001. The funicular and the tower elevator (included in the excursion cost) comfortably take you up to the Panorama-Restaurant "Café im Turm" and the panoramic view platform.
Duration: approx. 3 hours
Price per person: € 42,- (incl. VAT)

Tuesday, September 17, 09:00 a.m. Swarovski Crystal Worlds

A bus takes us through a number of typical Tyrolean villages to Wattens,

where the Swarovski Crystal Worlds opened their doors to the public. Through the huge water-spouting head of a botanic giant the visitor enters the mostly subterranean, unique magic World of Crystal. “This place is like a fairy tale come true. People suddenly experience what they previously knew only in their dreams”, says Viennese multimedia artist André Heller, creator of the Swarovski Crystal Worlds.

You have to experience yourself what is hard to describe: a view of the surreal landscape of a glittering galaxy, the inside of a gigantic crystal dome with changing patterns of light and sound, bizarre scenarios - a world of magic. You will have time to look for a souvenir in the crystal shop or enjoy a cup of coffee and a delicious Austrian cake.
Duration: approx. 4 hours
Price per person: € 48,- (incl. VAT)

Tuesday, September 17, 2:00 p.m. Exploring Tyrol’s History

This is a journey through Tyrol’s history and traditions. You travel by bus to the southern part of the city to discover some unique museums along the way. You visit the new “Tirol Panorama”, where Tyrol’s struggle for freedom is captured on a 1,000 m² gigantic panoramic painting. At “The Bell Museum of Grassmayr Bell Foundry”, you can feel the spark of craftsmanship when exploring the Bell Museum, which presents an unusual combination of bell foundry, museum and sound studio.
Duration: approx. 3 hours
Price per person: € 45,- (incl. VAT)

Wednesday, 18 September, 10:00 a.m. Mountain Experience “Seegrube”

This is nothing for the faint hearted; the cable car takes you up to Seegrube mountain peak, 1905 meters above sea level. Once you get there, you can enjoy a great panoramic view of the Inn Valley, the Stubai and Zillertal Valley Alps and of the Wipptal Valley up to the Italian border.
In no other place in the world is the dividing line between an urban area and rugged mountain terrain so thin. The new Nordkettenbahn transports you directly from the Congress Center to high mountain terrain in just twenty minutes. A visit to the Innsbruck Nordkette offers a unique panorama. Once you get to the mountain station of the funicular Hungerburg you can enjoy a new breathtaking view of the city of Innsbruck. A traditional “Brettljause” (Tyrolean snack) awaits you in the mountain restaurant (already included in the price of the excursion, beverages are at an extra cost!)
Duration: approx. 5 hours
Price per person: € 62,- (incl. VAT)

European News

Bernard Berry, European Editor

The ISVR at 50

2013 will mark the 50th anniversary of the foundation of the Institute of Sound and Vibration Research, at the University of Southampton, UK. To celebrate the achievements of its people, past and present, we will be hosting a two-day symposium on the 11th and 12th July 2013.

The symposium will feature talks from key speakers having an association with the ISVR, and will also include our annual E J Richards lecture. The celebrations will culminate in a social function with a buffet supper and entertainment. The tickets for the event are £50 for full attendance, with a reduced cost for partial attendance. Details of the event are available online at http://www.isvr.co.uk/ISVR-50th-anniversary

Disappointment over European Parliament Vote on Noise Limits

Efforts to reduce traffic noise across Europe suffered a setback earlier this year when MEPs voted to weaken current noise limits for sports cars and lorries. The outcome of the vote hinders moves to bring EU vehicle noise levels into line with World Health Organisation (WHO) recommendations for safe limits. T&E says MEPs have put pressure by the automotive industry ahead of the health of citizens.

For the past 20 years, noise limits have remained largely unchanged. In 2011, the Commission proposed a four-decibel cut in noise, which would have had the effect of more than halving current noise from traffic, but certain manufacturers, notably Porsche, lobbied against this. The result was a proposal from the legislation's rapporteur Miroslav Ouzky — that would effectively weaken the current standards, making sports cars and lorries even louder than they are today.

Ouzky's proposal was rejected in December by MEPs on the European Parliament's environment committee, but earlier this month the full Parliament approved the Ouzky proposal over the Commission's four-decibel reduction. This despite the fact that nearly half of all EU citizens are exposed to traffic noise above the level the WHO believes poses a serious risk to human health.

T&E vehicles officer Cécile Toubeau said: 'This vote wastes a once-in-a-generation opportunity to give us all quieter lives. It shows that MEPs put the scaremongering of the automotive industry above the health of citizens. As a result, our roads will get louder in the coming years.'

The legislation is not yet finalized. It now goes to representatives of member states, who are being strongly urged by T&E and other NGOs to favor the Commission's proposal over the plenary vote in the Parliament.

From TransportEnvironment.org – News, February 16, 2013

Win/Win/Win Situation — More Fuel-efficient Cars are Quieter Cars

New research commissioned by T&E has confirmed that measures aimed at improving fuel efficiency also reduce vehicle noise. The report was published just days before the environment committee of the European Parliament voted to tighten existing noise standards for vehicles, narrowly defeating an alternative proposal that would have allowed much louder cars, buses and lorries.

The research, published as *Road vehicle noise versus fuel consumption and pollutant emissions*, was timed to coincide with the MEPs' vote. It was prepared by the Dutch consultancy TNO, which advises the Commission on noise and carbon emissions. The report shows that developments in engine technology that improve fuel economy — thus cutting greenhouse gas emissions — will also reduce noise. One example is the use of smaller engines with turbochargers, as smaller engines are quieter and a turbo reduces noise still further.

Another TNO study testifies to the financial benefits of making cars quieter — it says reducing noise from vehicles is clearly the cheapest way to reduce harmful urban traffic noise. This counters suggestions from the car industry, notably Porsche, that towns and cities need to be designed differently to better assimilate traffic noise.

From TransportEnvironment.org — News, December 24, 2012

Pan-American News

Paul Donovan, Pan-American Editor

Proposal Would Allow All Pedestrians to Detect Vehicles that Do Not Make Sound

As required by the bipartisan Pedestrian Safety Enhancement Act of 2010 (PSEA), the U.S. Department of Transportation's National Highway Traffic Safety Administration (NHTSA) is proposing that hybrid and electric vehicles meet minimum sound standards in order to help make all pedestrians more aware of the approaching vehicles.

The proposed standard, Federal Motor Vehicle Safety Standard No. 141, would fulfill Congress' mandate in the Pedestrian Safety Enhancement Act that hybrid and electric vehicles meet minimum sound requirements so that pedestrians are able to detect the presence, direction and location of these vehicles when they are operating at low speeds.

The sounds would need to be detectable under a wide range of street noises and other ambient background sounds when the vehicle is traveling under 18 miles per hour. At 18 miles per hour and above, vehicles make sufficient noise to allow pedestrians and bicyclists to detect them without added sound. Each automaker would have a significant range of choices about the sounds it chooses for its vehicles, but the characteristics of those sounds would need to meet certain minimum requirements. In addition, each vehicle of the same make and model would need to emit the same sound or set of sounds.

NHTSA estimates that if this proposal were implemented there would be 2,800 fewer pedestrian and pedalcyclist injuries over the life of each model year of hybrid cars, trucks and vans and low speed vehicles, as compared to vehicles without sound.

CANADIAN ACOUSTICS

All past issues of Canadian Acoustics (and its predecessor CCA Newsletter) are available online at http://jcaa.caa-aca.ca. The future issues will be automatically published online since the editorial work is now internet-based. This should greatly boost readership of Canadian Acoustics worldwide and increase visibility for the Association. The most recent issues (past 12 months) will be accessible online to members/subscribers only. All members/subscribers will continue to receive a printed copy of Canadian Acoustics. Thank you to Jérémie Voix for this massive undertaking.

ICA 2013

The CAA is joining the Acoustical Society of America (ASA) in co-hosting the 21st International Congress on Acoustics (ICA 2013) to be held in Montreal, 2-7 June 2013. This meeting is chaired by Michael Stinson. Nearly 2000 abstracts were received, and 34 booths have already been reserved for the Exhibitor show! All participants are encouraged to book their accommodation as early as possible in expectation of a busy month of June in Montreal next year. The hotel reservation service is at https://resweb.passkey.com/go/Acoustical.

NYT Columnist Jane Brody Stresses Noise as the leading cause of hearing loss

New York Times author and blogger Jane Brody again stressed the impact of noise on hearing loss in her March 25, 2013 column, "Noise, not age, is the leading cause of hearing loss." Brody points to the lack of regulations governing repeated exposure to noise outside the workplace. She sites portable music deivce,s rock concerts, hair dryers, sirens, lawn mowers, leaf blowers, vacuum cleaners car alarms and countless other sources.

NNI publishers encourage readers to explore Ms. Brody's article and articles like this, and provide feedback in support of her efforts to education the public about the dangers of noise exposure. The article can be found at http://well.blogs.nytimes.com/2013/03/25/what-causes-hearing-loss/

NYC-DEP PRODUCES WEBSITE AND VIDEO TO EDUCATE ABOUT NOISE GUIDANCE

The New York City Department of Environmental Protection has provided a short instructional video available on youtube (http://www.youtube.com/watch?v=TyrNJ6E10IE) to help explain music mitigation methods to club owners and business people. Technical written information is on the web at: Noise Control Guidance for Nightlife Industry.

BERANEK HONORED BY IEEE

Leo Beranek, Founder (Retired), Bolt, Beranek, and Newman, Boston, MA, received the IEEE Founders Medal, for outstanding contributions in the leadership, planning, and administration of affairs of great value to the electrical and electronics engineering profession, sponsored by the IEEE Foundation, "For leadership as a co-founder of a premier consulting firm that shaped modern acoustical practice and laid the groundwork for the Internet, and for public service."

DAVIES GIVEN COURTESY APPOINTMENT

Patricia Davies, Ray. W. Herrick Director was given a courtesy appointment in the Department of Psychological Sciences in the College of Health and Human Sciences for her perception-based engineering research. Her courtesy appointment was recommended

by members in the Mathematical Computational Cognitive Science Psychology area.

New Staff at CTA

Cavanaugh Tocci Associates is pleased to announce two new staff members: Chris Bajdek and Liz Lamour. Chris will work primarily in environmental noise and Liz will spend most of her time on design of audiovisual systems.

Chris Bajdek brings 20 years of experience in environmental noise analysis to enhance CTA's capabilities in this growing area. As a senior consultant, he will use his extensive experience with prediction and analysis of noise from wind turbines, traffic, rail, and aircraft to provide clients with accurate analysis and recommendations. Chris is currently working on noise studies for the permitting of transfer facilities for FedEx Ground and supporting CTA's efforts on two proposed wind energy facilities in northern New England.

Liz Lamour is a recent graduate of the architectural acoustics program at the University of Kansas with a Master of Arts in Architecture. For her undergraduate studies, Liz attended Berklee College of Music in Boston and graduated *magna cum laude* with a dual-major Bachelor of Music degree in Music Production & Engineering and Professional Music. Her studies encompassed a wide range of topics, including: architectural acoustics, mechanical noise, electroacoustics, audio engineering, and signal processing. Liz was an intern at CTA in the summer of 2011 and now joins us full time in the Audiovisual Systems Group. She is currently working on designs for Middlebury College Fieldhouse, and Amherst College Science Center. In her spare time Liz likes spending time outdoors hiking and exploring New England, and playing music with friends.

Asia-Pacific News

Marion Burgess, Asia-Pacific Editor

Australia Workplace Safety Recent Actions on Human Vibration

The effects of excessive exposure to vibration in the workplace are a concern in many industry sectors and particularly construction and mining. Australia has a large number of workers in both these sectors and to date has no regulation or exposure standard and awareness of the health effects and available hazard controls is relatively low. The agency responsible for workplace health and safety, Safe Work Australia (SWA), has undertaken a number of actions in the last year. Following a series of awareness seminars around the country the agency is progressing towards establishing regulatory limits. As a first step it has promulgated fact sheets to raise awareness of exposure to whole-body and hand-arm vibration and give guidance on how to reduce the exposure of workers to vibration. The fact sheets provide information on the health effects resulting from exposure to vibration from common sources in the workplace. Information is included on the levels of exposure which are known to cause health effects, and suggested control measures which can be put in place. The next step will be the development of a model code of practice on controlling the risks of vibration at work. These sheets are available from: http://www.safeworkaustralia.gov.au/sites/SWA/AboutSafeWorkAustralia/WhatWeDo/Publications/Pages/Hand--arm-vibration-fact-sheet.aspx and http://www.safeworkaustralia.gov.au/sites/SWA/AboutSafeWorkAustralia/WhatWeDo/Publications/Pages/Whole-body-vibration-fact-sheet.aspx

Noise Induced Hearing Loss Priority

Safe Work Australia has published the Australian Work Health and Safety Strategy 2012-2022 to provide a 10 year framework to continue to drive improvements in workplace health and safety in this country. The strategy sets out four outcomes and seven action areas, seven priority industries and six priority work-related disorders. The latter includes Noise-induced Hearing Loss. More detail on this can be found from the strategy at http://www.safeworkaustralia.gov.au.

Science Media Assistance

The Australian Science Media Centre has developed a new free online tool, ScienceMediaSavvy.org, to help scientists work with the media and better inform public debate on the major issues of the day. ScienceMediaSavvy.org has been developed with support from the Australian CSIRO, and provides tips and advice for understanding and dealing with the news media. ScienceMediaSavvy.org is not intended to replace hands-on media training workshops. The instant online availability of ScienceMediaSavvy.org will help fill a gap in terms of what is currently available, giving advice on dealing with the media as needed, from any internet-enabled computer, smartphone or tablet.

A short video explaining what ScienceMediaSavvy.org is all about is available on YouTube at www.youtube.com/watch?v=zkph98pwCUg

Hearing Hub

Australian Hearing and the National Acoustics Laboratory have an excellent international reputation in relation to hearing and protection of hearing. Many acousticians would have visited their excellent purpose built facilities in Sydney. 2012 has marked a change as these two organisations have moved to the Macquarie University campus to form part of the Australian Hearing Hub. This is a unique, world-class facility purpose-designed to facilitate collaborative research into hearing and related speech and language disorders. The Australian Hearing Hub brings together the leading research teams and practitioners and will provide additional teaching and learning scope for students in Hearing, Audiology and language sciences.

Internoise 14

A major activity for the Australian Acoustical Society is the preparation for the Internoise 14 to be held in Melbourne, Australia, November 16-19, 2014. A comprehensive technical program is being developed. The Society looks forward to welcoming acousticians from around the world to Australia, and November is an excellent month to visit as it is the transition from Spring to Summer. For more information check www.internoise2014.com.

Taiwan noise laws tightened

Noise has always been a part of life in Taiwan, especially during its rapid industrialisation from the 1960s to 1990s. But in recent years, people have become less tolerant of it. The number of complaints has risen by 15% a year, to some 58,000 last year, according to the government's Environmental Protection Administration (EPA). That has forced the EPA to recently announce plans to toughen regulations. The maximum amount people can make across the board - from homes, to businesses and factories - must drop by three decibels, which would cut the volume by half, officials say. The time period when people can make loud noise has also been shortened. The measures will be the toughest ever taken, said Chou Li-chung, an EPA official in charge of dealing with noise. [extracted from report in BBC News, Taipei]

International Representatives

Below is a list of international contacts for the advertisers in this issue. The telephone number is followed by the fax number where available. In cases where there are two or more telephone numbers per location, or several locations within a country, a a semicolon (;) separates the telephone number(s) from the respective fax number. Advertisers are asked to send updated information by E-mail to INCEUSA@aol.com.

BSWA

Australia: KINGfDOM PTY LTD
+61 2 9975 3272
kingdom@kingdom.com.au

Australia: Noise Measurement Services
+61 7 3217 2850
bob@noisemeasurement.com.au

Austria: Ing. Wolfgang Fellner GmbH
+43 1 282 53 43
wf@shallmessung.com

Belgium: ABC International Trading B.V.
+31 162520447
nl@abctradings.com

Canada: Soft dB
+1 418 686 0993
contact@softdb.com

Egypt: Elnady Engineering and Agencies
+20 2 23425763
info@elnadycompany.com

Finland: APL Systems Ltd.
+358(0)442199940
Ville.ilves@apl.fi

France: ViaXys
+33 2 38 87 45 35
oliver.blazere@viaxys.com

Germany: ROGA Instruments
+49 (0) 6721 98 44 54
roga@roga-messtechnik.de

India: Welan Technologies
+91 20 25393126
info@welantechnologies.com

Ireland: Sonitus Systems
+353 01 2542560/+44 020 81236009
enquiries@sonitussystens.com

Israel: Emproco Ltd.
+972 (0) 8 6718187
sales@emproco.com

Italy: Spectra Sri
+39 613321
ecaglio@spectra.it

Korea: SM Instruments Co., Ltd.
+82 42 861 7004
youngkey@smins.co.kr

Serbia: NORTH Point Ltd.
+381 24 62 62 72
gajins@north.rs

Singapore: SHAMA Technoligies (S) Pte Ltd.
+65 6776 4006
shamatec@signet.com.sg

South Africa: Vibranalysis Instruments S.A./
+27 118867993 qqq +27 115075823
laurence@vibranalysis.co.za

South America: SMART Tech
+55 11 3168 3388
marcelo@smarttech.com.br

Spain: Anotec Consulting S.L.
+34 916 897 540
nico@anotec.com

Spain: PROTOS Euroconsultores de Ingeneria S.L.
+34 91 747 5891
Kimono.alexiou@protos-eci.es

Spain: Uros Ingenieria
+34 91 3329621
Jalon_id@uros.es

Sweden: Acoutronic AB
+46 87 650 280
toby@acoutronic..se

Sweden: Arotate-Consulting AB
+46 708 955150
janos@arotate.com

Sweden: Sound View Instruments
+46 (0) 70 681 79 89
Anders.norborg@soundviewinstr.com

Taiwan: OE SCIENTECH CO., LTD.
+886 -2 25115747
terry@oe.com.tw

Taiwan: Tops Technologies, Inc.
+886 932 068 059
kenlee@topstech.com.tw

Thailand: Geonoise Instruments Thailand Co. Ltd.
+66 042 34209
1info@geonoise-instruments.com

The Netherlands: ABC International Trading B.V.
+31 162520447
nl@abctradings.com

Turkey: DTA Ltd Sti.
+90 224 280 84 44A
kif.goksa@dta.com.tr

Turkey: VibraTek
+90 0312 479 0302
Ibrahim.Caglayan@vibratek.com.tr

United Kingdom: Sonitus Systems
+353 01 2542560/+44 020 81236009
enquiries@sonitussystens.com

USA: Scantek, Inc.
+1 410 290 7726
PeppinR@scantekinc.com

Campanella Associates

USA: Campanella Associates
+1 6140 876 5108
a.campanella@att.net

NTI

Australia: Amber Technology Pty Ltd
+61 2 9452 8600
lhart@ambertech.com.au

Austria: Wien-Schall GmbH
+43 1 811 55 100
proaudio@wienschall.com

Bahrain: ATEIS Middle East FZCO.
+971 4 6091325
info@ateis.ae

Belgium: Belram sa/nv
+32 2 672 95 90
info@belram.com

Brazil: NTI Americas Inc.
+1 503 684 7050
ntisales@ntiam.com

Bulgaria: ATC Ltd.
+35 988 9528 649
hlebarovg@dir.bg

Canada: NTI Americas Inc.
+1 503 684 7050
ntisales@ntiam.com

Chile: NTI Americas Inc.
+1 503 684 7050
ntisales@ntiam.com

China: NTI CHINA CO.,LTD.
+86 10 5791 0038
china@nti-audio.com

Czech Republic: NTi Audio Praha
+420 2209 99992
info@ntipraha.cz

Denmark: Kinovox Pro ApS
+45 44 53 3011
ck@kinovox.dk

Estonia: EW Sound & Light Vaarmann OÜ
+372 6612 768
ewsound@ewsound.ee

Finland: Noretron Components Ltd.
+358 (10) 525 8000
ari.nissinen@noretron.fi

France: SCV AUDIO
+33 1 486 322 11
f.voiffray@scv.fr

Germany: Hermann Adam GmbH & Co. KG
+49 8131 2808 0
info@adam-gmbh.de

Germany: Schalltechnik Süd & Nord GmbH
+49 201 5456 980
besselmann@akustiktest.de

Germany: Schalltechnik SÜD & NORD GmbH
+49 941 94 555 85
kotterer@akustiktest.de

Greece: Bon Studio S.A.
+30 210 380 9605 8
bon@bonstudio.gr

Hungary: Elimex Kft
+36 1 239 8270
zsofi@elimex.hu

India: AVF Distributors (I) Pvt. Ltd.
+91 22 2405 1686
info@avfindia.com

India: AVF Distributors (New Dehli)
+91-11-2 874 11 31
info@avfindia.com

Indonesia: Santika Multi Jaya
+62 21 6583 3535
andre@cbn.net.id

Iraq: ATEIS Middle East FZCO.
+971 4 6091325info@ateis.ae

Israel: Sontronics Electr. Equipm. Ltd
+972 3 570 5223
sales@sontronics.co.il

Italy: Spectra SRL
+39 039613321
info@spectra.it

Japan: NTI Japan Limited
+81 3 3634 6110
okayasu@nti-japan.com

South Korea: SOVICO Corporation
+82 2 2106 2877
ijchoe@sovico.co.kr

Latvia: Audio AE Ltd.
+371 67807310
audioae@audioae.lv

Lithuania: Midiaudio Ltd.
+370-37-223288
sales@midiaudio.com

Malaysia: TekMark Broadcast Sdn Bhd
+603 9057 8999
gs.wong@tekmarkgroup.com

Mexico: NTI Americas Inc.
+1 503 684 7050
ntisales@ntiam.com

Netherlands: TM Audio Holland B.V.
+31 30 2414070
reinier.bruijns@tmaudio.nl

New Zealand: Amber Technology (NZ) Ltd.
+64 9 443 0753
ross@amber.co.nz

Norway: Benum siv. ing. AS
+47 2213 9900
post@benum.com

Poland: Konsbud Audio Sp. Z O.O.
+48 226 44 3038
info@konsbud-audio.com.pl

Portugal: Arestel S.A.
+351 213 030 850
audiovideo@arestel.pt

Romania: db Technolight
+40 268 331 410
dan@dbt.ro

Russia: I.S.P.A. Russia
+7 495-784-75-75
ispa@ispa.ru

Singapore: d&b Audiotechnik S.E.Asia Pte
+65 67952268
info.asia@dbaudio.com.sg

Slovakia: NTi Audio Praha
+420 2209 99992
info@ntipraha.cz

Slovenia: AVC Slovenia
+386-1-530 78 70
jani.medic@avc-group.si

South Africa: Wild & Marr (Johannesburg)
+27 11 974 0633
info@wildandmarr.co.za

Spain: Neotécnica, S.A.
+34 91 542 09 00
neotecnica@neotecnica.es

Sweden: Sennberg AB
+46 8 566 16400
stephan.segermark@sennberg.se

Switzerland: Contrik AG
+41 44 736 50 10
contrik@contrik.ch

Taiwan: NTI CHINA CO.,LTD.
+86 512 6802 0075
china@nti-audio.com

Thailand: Vichai Trading Co., R.O.P.
+662 559 0956 8
victorco@truemail.co.th

Turkey: SF SES VE Isik Sistemleri Ltd
+90 212 227 6800
samimm@sf.com.tr

Ukraine: Real Music Ltd.
+380-482 347382
realmusic@realmusic.ua

United Kingdom: Neutrik (UK) Ltd.
+44-1983-811 441
sales@neutrik.co.uk

USA: NTI Americas Inc.
+1 503 684 7050
ntisales@ntiam.com

Scantek, Inc.

Mexico and South America: CIAAMSA
División Acústica
+55 1054 3209/+55 1054 3210
nbenitez@ciaamsa-acustica.com

SoundPLAN LLC

Argentina: Dakar ingenieria acustica
Argentina
+54 (11) 4631 5691/+54 (11) 4 865 79 84
soundplan@dakar-acustica.com.ar

Australia: Marshall Day Acoustics
+612 9282 9422/+612 9281 3611
bmartin@marshallday.com.au

Brazil: GROM Acustica & Automacao
+55 212516 0077/+55 21 2516 0308
comercial@grom.com.br

Canada: Navcon Engineering Network
+1 714 441 3488/+1 714 441 3487
Forschner@navcon.com

China: BSWA Technology Co., Ltd.
+86 10 62526360/+86 10 82251626
conghaidong@bswa.com.cn

Chile: Sinruido
+562 2398736
Ing.mora@gmail.com

Columbia: High Tec Environmental Ltda
+57 1 6713700/+57 1 6713700x100
soporte@hteltda.com

Czech Republic: SYMOS s.r.o.
+42 220 999 977/+42 257 225 679
symos@symos.cz

Denmark: SoundPLAN Nord
+45 (39) 46 12 00/+45 (39) 46 12 02
jkl@soundplan.dk

Egypt: Elnady Engineering and Agencies
+20 2 23420896/+20 2 23421791
info@elnadycompany.com

Egypt: Elnady Engineering and Agencies
+2 (02) 23420896/+2 (02) 23426977
info@elnadycompany.com

Finland: SoundPLAN Nord
+45 (39) 46 12 00/+45 (39) 46 12 02
jkl@soundplan.dk

France: Euphonia
+33 02 40 18 05 18/+33 02 40 19 05 20
bsuner@euphonia.fr

Germany: Braunstein + Berndt GmbH
+49 7191 91 44 0/+49 7191 91 44 24
bbgmbh@soundplan.de

Greece: I Acoustics Hellas
+30210 6630 333/+30210 6630 334
dpramas@acoustics.gr

Hungary: VIBROCOMP GmbH
+36 1 3107292/+36 1 3196303
bitep@vibrocomp.hu

India: Foretek Marketing Pvt. Ltd.
+91 80 2525 4706/+91 80 2525 6813
info@foretek.in

Italy: Spectra s.r.l.
+39 039 613321/+39 039 6133235
spectra@spectra.it

Ireland: Marshall Day Acoustics
+44 28 308 98009/+44 788 540 6961
shane.carr@marshallday.co.uk

Israel: RTA Engineering Ltd.
+972 51 414 8162/+972 (0) 77 6499964
Ronen@rtaeng.com

Indoneisa: Pt.Dananwingus Sakti,
+628161812871
Antonius.wira@ptdws.com

Japan: Ono Sokki Co., Ltd.
+81 45 935 3818/+81 45 935 3806
Watanan@onosokki.co.jp

Kenya: Machoy cc
+27 214245719
machoy@iafrica.com

Korea (South): ABC TRADING
+82 2 2226 3161/+82 2 2226 7383
yklee@abctrd.com

Kuwait: Elnady Engineering and Agencies
+20 (02) 23420896/+20 (02) 23426977
tamer@elnadycompany.com

Malaysia: Acoustics & Environmental Solutions
+65 6776 2212
aes@aes-aes.com

Mexico: Ingenieria Acustica Spectrum Sa Cv
+52 55 55 67 08 78/+52 55 53 68 61 80
acusticaspectrum@prodigy.net.mx

New Zealand: Marshall Day Associates
+64 9 379 7822/+64 9 309 3540
siiri.wilkening@marshallday.co.nz

Norway: SoundPLAN Nord
+45 (39) 46 12 00/+45 (39) 46 12 02
jkl@soundplan.dk

Peru: Global Group S.A.
+51 1 4464627
Cervetto@globalgroupsa.com

Poland: PC++ Software Studio S.C.
+48 606 110 270
support@pcplusplus.com.pl

Portugal: AAC Centro de Acustica Aplicada SL
+34 45 29 82 33/+34 45 29 82 61
aac@aacacustica.com

Romania: Vibrocomp Kft
+40 723 614 524/+36 1 3196303
bitep@vibrocomp.hu

Russia: Baltic State Technical University
+7 812 7101573/+7 812 2988148
marina_butorina@inbox.ru

Serbia: Dirigent Acoustics D.O.O.
+381 11 28 50 601/+381 11 763 887
dgtdejan@yahoo.com

Singapore: Acoustics & Environmental Solutions
+65 6776 2212
aes@aes-aes.com

South Africa: Machoy cc
+27 214245719
machoy@iafrica.com

Spain: AAC Centro de Acustica Aplicada SL
+34 45 29 82 33/+34 45 29 82 61
aac@aacacustica.com

Sweden: SoundPLAN Nord
+45 (39) 46 12 00/+45 (39) 46 12 02
jkl@soundplan.dk

Thailand: Geonoise Instruments Thailand
+662 860 2699/+662 860 3600
soundplan@geonoise-instruments.com

Taiwan: Purtek Engerprise Co Ltd.
+886 2 2769 3863/+886 2 2756 7582
purtek@ms13.hinet.net

Turkey: Hidrotek Mimarlik Muhendislik Ltd.Sti,
+90 216 372 20 2/+90 216 384 72 51
aakdag@hidro-tek.com

United Arab Emirates: Elnady Engineering and Agencies
+20 2 23420896/+20 2 23421791
info@elnadycompany.com

United Kingdom: SoundPLAN UK&I
+44 1787 478498
david@soundplanuk.co.uk

USA: Navcon Engineering Network
+1 714 441 3488/+1 714 441 3487
Forschner@navcon.com

Vietnam: Viet Phuong Consultants and Technology J.S Co.
+84 08 3834 5931/+894 08 3834 5928
quoc@vietphuonggroup.com

Zero International

Australia: Hafele Australia Pty. Ltd.
+61 3 9212 2061
djones@hafele.com.ua

Canada: Les Agences Real Demers, Inc.
+1 514 387 7515
realdemers@ard.ca

Hong Kong: Zero Asia Pacific
+81 45 567 4117
zeroasiapacific@gmail.com

Australia: Hafele Australia Pty. Ltd.
+61 3 9212 2061
djones@hafele.com.ua

Indonesia: Zero Asia Pacific
+81 45 567 4117
zeroasiapacific@gmail.com

Japan: Zero Tokyoman & Co. Ltd.
+048 866-8660
henmi@tokyoman.co.jp

Korea: Zero Asia Pacific
+81 45 567 4117
zeroasiapacific@gmail.com

Malaysia: Zero Asia Pacific
+81 45 567 4117
zeroasiapacific@gmail.com

The Netherlands: Alprokon Aluminum
+31 180 643962
henk.vanherpen@alprokon.com

New Zealand: F.L Bone & Son Limited
+64 873 0282
ian.h@flbone.co.nz

Philippines: Zero Asia Pacific
+81 45 567 4117
zeroasiapacific@gmail.com

Singapore: Zero Asia Pacific
+81 45 567 4117
zeroasiapacific@gmail.com

Taiwan: Zero Asia Pacific
+81 45 567 4117
zeroasiapacific@gmail.com

Thailand: Zero Asia Pacific
+81 45 567 4117
zeroasiapacific@gmail.com

United Arab Emirates: Zero East
+052 152 7406
kazi@zerollc.com

United Kingdom: Zero Seal Systems Ltd.
+44 1785 282910
sales@zeroplus.co.uk

Venezuela: Jose' Miguel Herrera O.
+58 212 514 7541

Vietnam: Zero Asia Pacific
+81 45 567 4117
zeroasiapacific@gmail.com

SENSIDYNE ANNOUNCES A NEW FOUR-CHANNEL ANALYZER

The Svantek SVAN 958 Four Channel Sound and Vibration Analyzer with time domain signal recording. It is a fully digital, simultaneous four channel, 20 kHz signal analyzer including Type 1 sound level meter (meeting IEC 61672) and vibration meter (meeting ISO 8041:2005).

STUDY APP WITH SOOTHING SOUNDSCAPE TO ASSIST STUDENTS' CONCENTRATION

The Sound Agency launched a new, simple and free app at Sound Education delivers 45 minutes of scientifically designed productivity boosting sound that can mask ambient noise, help focus, improve cognition and reduce fatigue. The soundscape is custom designed to promote cognition combining natural sounds, especially birdsongs with a slow tempo and high frequency soothing musical sounds. The overall effect should be to elicit a body-relaxed, mind alert state which is focused and ready to concentrate. The App can be downloaded for apple or android devices go to the SoundEducation.tv and click on the links there.

NEW NON-PROFIT, VOLUNTEER RUN ACOUSTICS AND VIBRATIONS CONSULTING COMPANY

Richard J. Peppin, founder and past president of Scantek, Inc. of Columbia, MD, recently announced the launch of Engineers for Change, an acoustics and vibrations consulting company. The company is different from many others in that it is non-profit and all volunteer run. That means 100% of all fees earned will be donated to charities. Only out-of-pocket, travel-related, expenses are reimbursed to employees. The company actively recruits volunteers to work part-time, doing what they know best, while contributing to change the world for the better.

AFMG ANNOUNCES NEW TECHNOLOGY AT PROLIGHT & SOUND 2013

The new FIRmaker technology was showcased by the company on April 10 at their Booth at ProLight & Sound in Frankfurt, Germany. The company claims the new technology "will bust the limits" of today's most advanced sound systems such as line arrays and column loudspeakers.

KEENE NOISE CONTROL PRODUCTS ANNOUNCES "NEW & IMPROVED" PERFORMANCE CALCULATOR

The online noise performance calculator can be used to see how their Quiet Qurl® product will perform in Floor/Ceiling assemblies. Quiet Qurl MT is a highly compressible polyester fabric bonded to the standard Quiet Qurl products. It is a noise control insulation mat designed to limit impact noise between floors. On the top side, the standard Quiet Qurl product has a point-bonded, moisture-resistant fabric which is laminated to the surface so that gypsum concrete and other materials can be placed to create a floating floor. On the bottom side is the white compressible polyester fabric called MT, "Muffling Technology."

MEGGITT SENSING SYSTEMS PUBLISHES MARCH NEWSLETTER

The March Measurement Newsletter is available at https://www.endevco.com/news/newsletters/2013_03/2013_03.html. In this issue there is a definition of the Figure of Merit for accelerometers with and explanation of its importance. Information is also provided on the Model 7240C miniature high-frequency low bandwidth accelerometer. A link is also provided to a technical paper providing guidance on accelerometer installation.

Meggit also released Tech Paper 319 which provides a guide to the ijnstallation of acclerometers (link). In Tech Paper 324 information is provided with regard to dealing with accelerometer noise.

Finally, the new Endevco 65TLPF high temperarure IEPE triaxial accelerometer was announced.

LMS INTRODUCES LMS SOUNDBRUSH, THE FIRST TECHNOLOGY TO VISUALIZE SOUND FIELDS IN 3D WHILE MEASURING

LMS International announces the introduction of LMS SoundBrush, its new and patented acoustic troubleshooting solution. LMS SoundBrush is a revolutionary, easy-to-use and complete tool that enables engineers to map sound propagation around an object and localize acoustic sources. At the heart of the compact SoundBrush solution is the patented optical trackingtechnology, combined with either a G.R.A.S. Sound & Vibration sound pressure microphone or a 3D intensity sensor. When moving the SoundBrush probe freely around the test object in any orientation orposition, the sound field is immediately visualized on screen in 3D.

PCB PIEZOTRONICS RELEASES NEW 60,000 G MEMS PIEZORESISTIVE TRIAXIAL SHOCK ACCELEROMETER

PCB Piezotronics, Inc., introduces a new triaxial High-G MEMS, Piezoresistive Triaxial Shock Accelerometer featuring a unique 45 degree package orientation, with DC response, damping

and mechanical stops for over-range protection. PCB Model 3503A1060KG contains three silicon MEMS sensing elements. The sensor is designed for shock testing, and is packaged in a titanium housing, with two through-holes for 4-40 mounting screws and has a measuring range of 60,000 G and minimum zero-shift after a shock. The new sensor compliments PCB's 20,000 G triaxial Model 3503A1020KG. For technical information, please contact Bob Metz, Product Manager, at 866-816-8892 at or via e-mail: bmetz@pcb.com

PCB ANNOUNCES A NEW SERIES OF MULTI-PURPOSE SIGNAL CONDITIONERS

This is the next generation multi-channel signal conditioners. PCB® Models 483C40 and 483C41 are designed for use with ICP® and traditional charge output sensors, and also accept a direct voltage input. These models are extensions of the existing 483C Series of 8-channel signal conditioners and now feature selectable low pass filtering. Model 483C40 can be setup and controlled through an Ethernet interface. Model 483C41 has both an Ethernet interface and a front panel keypad and display for setup and control. Both models are supplied with Multi-Channel Signal Conditioner (MCSC) Control Software.

LARSON DAVIS HAS UPDATED THEIR AUDIOMETER CALIBRATION SOLUTION.

Enhancements include:

- Audittm v2.2 Software for audiometer calibration
- Windows 7 & 8 compatible - the application will install and run natively
- DVX008A and DVX011 are supported in Windows 7 & 8
- New couplers can be added and RETSPL values entered with the new RETSPL editor

Contact technical support for help with software download.

ECOPHON ACOUSTIC BULLETIN QUARTERLY

The most recently quarterly from Ecophon provides information on a number of topics. One topic of note is the Sound Education Seminars conducted throughout Europe. These seminars are focused on school acoustics and have been well attended. There are a number of other aticles of interest in this quarterly bulletin.

NAVACON ENGINERING NETWORK ANNOUNCES A SERIES OF ENVIRONMENTAL NOISE SEMINARS

A series of environmental noise seminars and SoundPLAN software training sessions is being offered by Nvacon.

DELTA ANNOUNCES noiseLAB EXPRESS

The noise lab express software provides a suite of tools for the analysis of wav files. The capabilities provided include sound level calculations, third octave analysis, and FFT analyses.

Acknowledgements

INCE/USA Liaison Program

ACO Pacific, Inc. ..... Belmont, California
AVAC Continuing Education ..... Pittsburgh, Pennsylvania
Colin Gordon and Associates ..... San Bruno, California
Acoustical Solutions ..... Richmond, Virginia
Cavanaugh Tocci Associates ..... Sudbury, Massachusetts
G.R.A.S. Sound and Vibration ..... Vedbaek, Denmark
Harris Miller Miller & Hanson Inc. ..... Burlington, Massachusetts
Noise Control Engineering, Inc. ..... Billerica, Massachusetts
Overly Door Company ..... Greensburg, Pennsylvania
Scantek, Inc. ..... Columbia, Maryland
Vibro-Acoustics ..... Scarborough, Ontario, Canada
Wyle Laboratories ..... Arlington, Virginia

Sustaining Members of International INCE

A-Tech S.A. ..... Belgium
Brüel & Kjær A/S ..... Denmark
Cetim ..... France
Ecophon AB ..... Sweden
G.R.A.S. ..... Denmark
LMS International NV ..... Belgium
Narita International Airport Corporation (NAA) ..... Japan
Norsonic AS ..... Norway
Rion Co., Ltd. ..... Japan

Institutional Members of International INCE

Belgium ..... Laboratorium voor Akoestiek en Thermische Fysica, Leuven
Argentina ..... Centro de Investigación en Acustica del Sistema INTI, Parque Technológico Miguelete, Buenos Aires
Belgium ..... Laboratorium voor Aoestiek en Thermische Fysica, K. U., Leuven
France ..... Centre Technique des Industries Méchanique, Senlis
Korea ..... Center for Noise and Vibration Control Engineering, Taejon
New Zealand ..... Centre for Sound Studies, Institute Food Nutrition and Human Health, Massey University Wellington, Wellington
Portugal ..... Laboratorio Nacional de Engenharia Civil, Lisboa
Sweden ..... Department of Applied Acoustics, Chalmers University of Technology, Gothenburg
United States of America ..... Graduate Program in Acoustics, The Pennsylvania State University, 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.

2013 August 28-30
NOISE-CON 13
Denver, Colorado, USA
Contact:
Institute of Noise Control Engineering-USA
Suzanne Basse
100 East Washington Street
Springfield, IL 62701
Telephone: +1 217-528-9945
http://www.inceusa.org/nc13

2013 August 30-September 1
Wind Turbine Noise 2013
Denver, Colorado, USA
http://www.windturbinenoise2013.org

2013 September 15-18
INTER-NOISE 13
Innsbruck, Austria
Contact:
Austrian Noise Abatement Association
Dresdner Straße 45/3.19, 1200 Wien
Tel.: +43-664-1865630
Fax.: +43-2287-4963
E-Mail: internoise@oal.at
http://www.internoise2013.com/

September 7-10, 2014
NOISE-CON 14
2014 National Conference on Noise Control Engineering
Ft. Lauderdale, Florida

November 16-19, 2014
INTERNOISE 2014
2014 International Congress on Noise Control Engineering
Melbourne, Australia

August 9-12, 2015
INTERNOISE 2015
2015 National Conference on Noise Control Engineering
San Francisco, California

Directory of Noise Control Services

Information on listings in the Directory of Noise Control Services is available from the INCE/USA Business Office, 100 East Washington Street, Springfield, IL 62701 +1 217 528 9945. Telephone: +1 317 735 4063: e-mail: ibo@inceusa.org. The price is USD $460 for 4 insertions.

Mark your calendar and plan to participate!

INTER-NOISE 2013

Innsbruk, Austria • September 15-18

INTERNOISE 2013, the 42nd International Congress and Exposition on Noise Control Engineering, will be held in Innsbruck, Austria from 15-18 September 2013 . The Congress is sponsored by the International Institute of Noise Control Engineering (I-INCE), and is being organized by the Austrian Noise Abatement Association (Österreichischer Arbeitsring für Lärmbekämpfung) (ÖAL). The theme of the congress is ***Noise Control for Quality of Life.***

INTERNOISE-2013 will be held at the Congress Center Innsbruck. A large block of rooms has been negotiated at highly competitive rates.

We anticipate a large, broad program of sessions on a variety of acoustics and noise topics. As usual, a large exposition of vendors offering noise control materials, software, and measurement devices will be held. In addition to the full program, INTERNOISE 2013 offers several short course on September 15 for noise control professionals, as well as several social programs and tours for accompanying persons.

Registration is now open at http://internoise2013.com/index.php/registration.html

The **Index of Advertisers** contained in this issue is compiled as a service to our readers and advertisers; the publisher is not liable for errors or omissions although every effort is made to ensure its accuracy. Be sure to let our advertisers know you found them through *Noise/News International* magazine.

The INCE/USA Page at the Atlas Bookstore

www.atlasbooks.com/marktplc/00726.htm

INTER-NOISE 06 Proceedings

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 engineering was held held in Honolulu,Hawaii, USA on December 3-6, 2006. The theme of the congress was "Engineering a Quieter World."

The technical topics covered at INTER-NOISE 06 included:

- Aircraft and Airport Noise Control
- Community Noise
- Fan noise and aeroacoustics
- Highway, automobile and heavy vehicle noise
- Machinery noise
- Noise policy
- Product noise emissions
- Sound quality.

The NOISE-CON 2011 Proceedings Archive (1996-2011)

NOISE-CON 2011 was held jointly with the Transportation Research Board (TRB) ADC40 Committee on Transportation-Related Noise and Vibration on 25-27 July, 2011 at the Marriott Downtown Waterfront Hotel in Portland, Oregon. One hundred forty seven (147) technical presentations were given at the conference and of those, 132 were submitted as written papers that are included on this DVD.

This DVD contains the proceedings of ALL NOISE-CON conferences held since 1996. This includes the years 1996, 1998, 2000, 2001, 2003, 2004, 2005, 2007, 2008, and 2010. Also included are the proceedings of two sound quality symposia, 1998 and 2002. So, including the NOISE-CON 2011 papers, a total of 1621 technical papers are included on this DVD. All papers are in PDF format.

INTER-NOISE 2012 PROCEEDINGS

Distinguished Lectures • Technical Papers • Poster Sessions • Parallel Sessions

INTER-NOISE 2012, the 41st International Congress and Exposition on Noise Control Engineering, was held in New York City, USA, from 19-22 August 2012 at the Marriot Marquis in Times Square. The congress theme was Quieting the World's Cities. The congress was held in conjunction with the American Society of Mechanical Engineers Noise Control and Acoustics Division (ASME NCAD) annual meeting, was sponsored by the International Institute of Noise Control Engineering (I-INCE), and was organized by the United States Institute of Noise Control Engineering (INCE-USA). The Acoustical Society of America (ASA) and SAE International also co-sponsored the event. One thousand and thirteen (1,013) technical presentations and sixty (60) poster presentations were given, along with three plenary presentations. One thousand sixty three (1,063) of the presentations were submitted as written papers that are included on this DVD.

This DVD also contains the proceedings of five additional INTER-NOISE Congresses. These are:

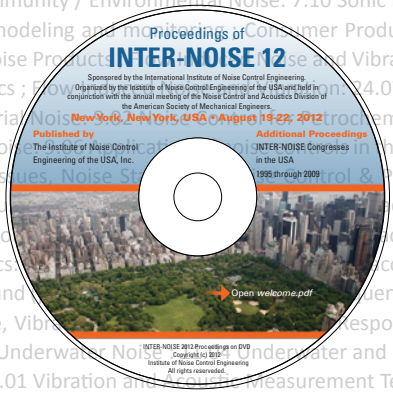
INTER-NOISE 1995, Newport Beach, California, USA

INTER-NOISE 1999, Fort Lauderdale, Florida, USA

INTER-NOISE 2002, Dearborn, Michigan, USA

INTER-NOISE 2006, Honolulu, Hawaii, USA

INTER-NOISE 2009, Ottawa, Canada



Written papers for INTER-NOISE 2012 were submitted in twenty four technical theme areas with a total of one hundred and twelve individual technical sessions. Twenty one parallel sessions were run over the three day conference. The largest technical themes (several individual sessions had more than 20 papers each) were the Architectural Noise / Building Acoustics (142 papers), Community / Environmental Noise (117 papers), Motor Vehicle Noise, Interior and Exterior (113 papers). However, there was also a strong turn-out in other technical areas

INTERNOISE 12 DVD ORDER FORM

Enclosed is my check (or credit card authorization) for _____ U.S. dollars. Please send me _____ copies of the INTERNOISE-2012 CD-ROM at 75 U.S. dollars each. Shipping and handling charge: domestic, 2 U.S. dollars; all other countries, 5 U.S.dollars. Shipped by first class mail in the United States and by air mail to other countries. Stock number: IN12.

Name ☐ **Mr.** ☐ **Ms.** ☐ **Dr.** ☐ **Prof.** _____

Address _____

City _____ **State/Province** _____ **Zip/Postal Code** _____

Country _____

E-mail _____

Credit card authorization: ☐ **Visa** ☐ **MasterCard** ☐ **American Express**

Card Billing address:

City _____ **State/Province** _____ **Zip/Postal Code** _____

Country _____

You may order by postal mail, telephone (USA and Canada only), by FAX, or by e-mail. Postal mail: Bookmasters, Inc., Distribution Services Division, 30 Amberwood Parkway, Ashland, OH 44805, USA. Telephone: 1 800 247 6553; FAX: 1 419 281 6883; e-mail: order@bookmaster.com. Internet: Go to the INCE/USA page at Bookmasters Atlas Bookstore. http://www.atlasbooks.com/marktplc/00726.htm