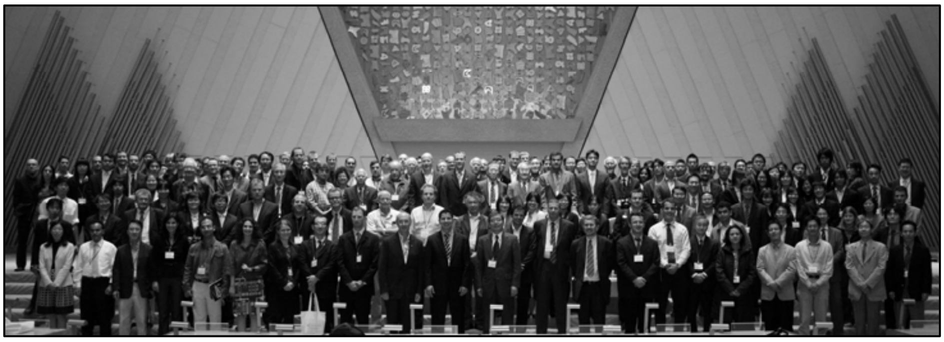
AIR INFORMATION REVIEW

VOL 30, No. 1, December 2008

A quarterly newsletter from Air Infiltration and Ventilation Centre

The 29th AIVC Conference
Advanced building ventilation and environmental technology for addressing climate change issues
Kyoto, October 2008



Participants of the 29th AIVC conference together in the Kyoto conference hall where the Kyoto Protocol was signed

On 14-16 October 2008, the 29th AIVC Conference was held at the Kyoto International Conference Center, where the Kyoto Protocol was negotiated in December 1997. The conference had been organised by the Building Research Institute of Japan (BRI), the National Institute for Land and Infrastructure Management (NILIM), IEA ECBCS Program, AIVC and INIVE. Through the review process by the scientific committee, which consisted of twenty-nine international and twenty-seven domestic experts, 165 papers were selected and presented. A total of 207 experts attended the conference (Europe 82, Japan 89, other Asian Countries 28, North America 6 and other countries 2). On behalf of the organising committee, we would like to express our sincere gratitude to the scientific committee members as well as to all of the participants and presenters having contributed to the great success of the conference.

In addition, it is our pleasure to announce that in the closing session, the following papers were presented the best paper and the best poster awards, by Dr. Max Sherman, the chairman of the steering committee of the AIVC.

The best paper:
H. Kotani and T. Yamanaka, "Interference Coefficient for Discharge Coefficient in Prediction of Cross Ventilation Rate through Large Openings"

The best posters:
- N. Choi, K. Sagara, T. Yamanaka, H. Kotani, T. Suzuki and T. Yamashita, "Displacement Ventilation System with Radiation Panel for Sickroom - Influence of Radiation Panel on Contaminant Concentration Profile"
- Stefano Schiavon and Arsen K. Melikov, "Energy Analysis of A Personalized Ventilation System in A Cold Climate: Influence of The Supplied Air Temperature"
- B.M. Jones, R. Kirby and M. Kolokotroni, "Quantifying The Performance of A Top-Down Natural Ventilation Windcatcher"

Dr. Shuzo Murakami
Chief Executive
Building Research Institute, Japan

Dr. Takao Sawachi, Director
Environmental Engineering Dept.
Building Research Institute, Japan

An overview of national trends related to innovative ventilation systems

AIVC VIP 30, 2008, 4 pp
N. Heijmans and P. Wouters
P. Heiselberg


Ventilation Information Paper n° 30
November 2008
AIVC
Air Infiltration and Ventilation Centre
An overview of national trends related to innovative ventilation systems
1 Introduction
2 Definition of innovative systems
3 Drivers and barriers for innovation in the ventilation industry

This paper summarises presentations and discussions that took place during the workshop entitled “Trends in national building ventilation markets and drivers for change” held in Ghent, Belgium, in March 2008 with a specific focus on innovative (ventilation) systems. Before this workshop, experts were asked to provide information regarding their national situation and the difficulties they experienced to improve the situation in terms of market penetration of innovative systems, indoor air quality and energy use requirements, and compliance check schemes. This has resulted in a set of Ventilation Information Papers published in the same series. This paper summarises the innovation issue.

Download the new VIP

Recent ENTPE/LASH laboratory actions to enhance hybrid ventilation systems performances

M. El Mankibi, P. Michel and G. Guarracino

Ventilation has a major impact on the global performance of buildings, in terms of energy consumption as well as regarding indoor climate: thermal comfort, indoor air quality, and acoustics. Thus a ventilation control strategy must be designed and evaluated within a systemic approach using simulations and experiments. Several constraints and parameters have to be taken into account as soon as possible in the design of the building: indoor air quality, noise, occupancy, physical phenomena, climate, ventilation configuration, maintenance, control parameters, sensors and actuators…

The design procedure of ventilation systems control architecture adopted at the ENTPE/LASH laboratory takes different aspects into account. Hence, the state of the art allows taking advantage of hardware and software technology and applying standards specifications. The ventilation design principles also take into account: Building type, building regulation, climate, local environment, thermal and ventilation demands and user preference.

Several control strategy architectures were tested in order to select the appropriated ones.

Therefore, ventilation system design depends on the complexity of the developed architectures (Opening, vent, actuators, sensors, …).

The evaluation and tuning stage is of special importance because it allows selecting the appropriate control strategy architecture.

Nowadays there is still a lack of knowledge concerning either the selection of the adapted controller or the assessment of developed ones.

Multicriteria approaches are usually used to assess advanced controller based architectures. The fitness function is a multicriteria tool that can be used to solve this problem. It aims at providing an objective measure of any controller and its value has to be minimised. Several models of fitness function were developed.

Following this philosophy, several research projects (PHACES, CLINAT, ...) were initiated at the LASH/DGCB (ENTPE – France) in association with industrial partners (SOMFY, ALDES, TECHNAL, ...) and French governmental organisms (ADEME, MEEDDAT, …). Thus, advanced control strategies architectures were designed and tested and various problems linked to active facades, intermittent occupancy and hybrid ventilation systems management were tackled.

Figure 1 - Hierarchical fuzzy logic based architecture cell

AIR Information Review

The newsletter of the AIVC, the Air Infiltration and Ventilation Centre. This newsletter reports on air infiltration and ventilation related aspects of buildings, paying particular attention to energy issues. An important role of the AIVC and of this newsletter is to encourage and increase information exchange among ventilation researchers and practitioners worldwide.

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Preparation: Christophe Delmotte, Sabrina Prieus & Peter Wouters - Editing: Erika Malu

An experimental device test cell called HYBCELL (figure 1) has been used to test and to assess designed control architectures. It is 5.1 m long, 3.5 m wide, 2.9 m high and represents a small meeting room or a large office within a large hall whose temperature can be controlled to create an artificial climate around it. The front of the cell communicates with the outdoor climate through eight different windows. All walls are made from office building materials.

The cell is equipped with an electric heater, a fan, window engines, CO_2 generation and sensible heat supply devices. Various sensors (temperature, pressure, relative humidity, CO_2 concentration, COV) were installed in the test cell as well as in the hall and outdoors. In addition, wind velocity, wind direction and solar radiation data are provided by a meteorological station located near the cell.

The CO_2 generation and sensible heat supply devices simulate occupancy in the experimental cell.

In order to assess developed architectures this test cell was modeled and simulations were carried out using HYBCELL1.0. This tool has been developed under the Matlab/Simulink environment by coupling a thermal model based on finite differences and a pressure air flow model.

Indoor air temperature is calculated from various heat transfers phenomena such as heat transfer through the walls and other enclosure structures, air infiltration and ventilation, internal heat gains and auxiliary heating or cooling.

Developed control strategy architectures are based on hierarchical fuzzy controllers in order to minimise the number of rules since they grow exponentially with the number of variables and fuzzy sets.

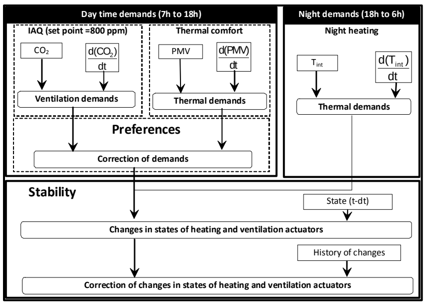


Figure 2 - Hierarchical fuzzy logic based architecture

Figure 2 illustrates an example of developed fuzzy architectures for winter. Each layer of these architectures is a fuzzy controller (see example in figure 3) with two inputs and one output. The purpose of the first layer is to identify the system thermal and ventilation demands in terms of IAQ. The second layer (energy preference) defines whether IAQ or thermal comfort should be a priority according to the preferences of the designer.

The final level is dedicated to the choice of type of ventilation, the required fan speed, the window's aperture and heating power status according to the history of decisions and the thermal or IAQ demands. Figure 3 shows the fuzzy controller for ventilation demands according to CO_2 values.

Results in terms of CO_2 concentrations of the simulations and experiments carried out using the HYBCELL cell test are shown in figure 4.

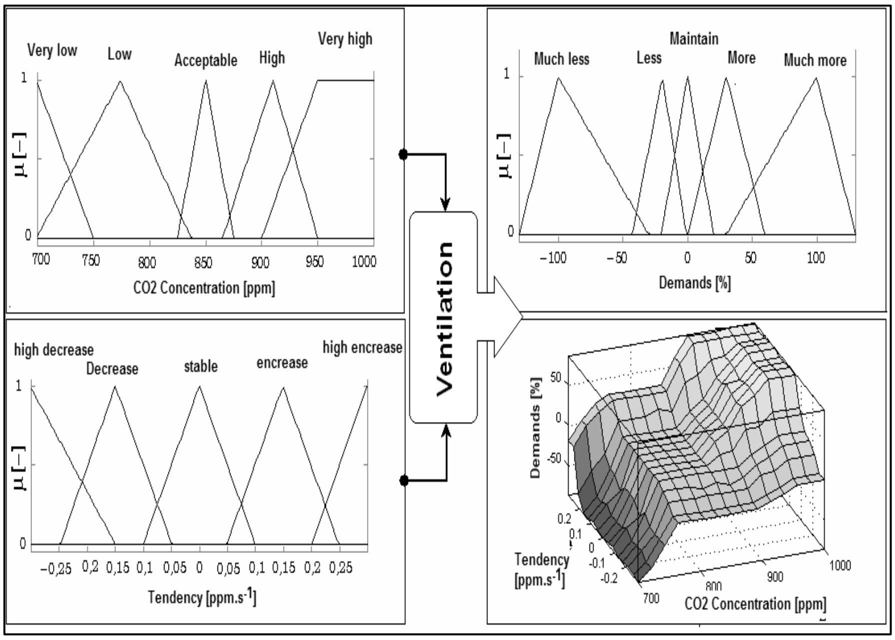


Figure 3 - Ventilation demands (CO2) fuzzy controller

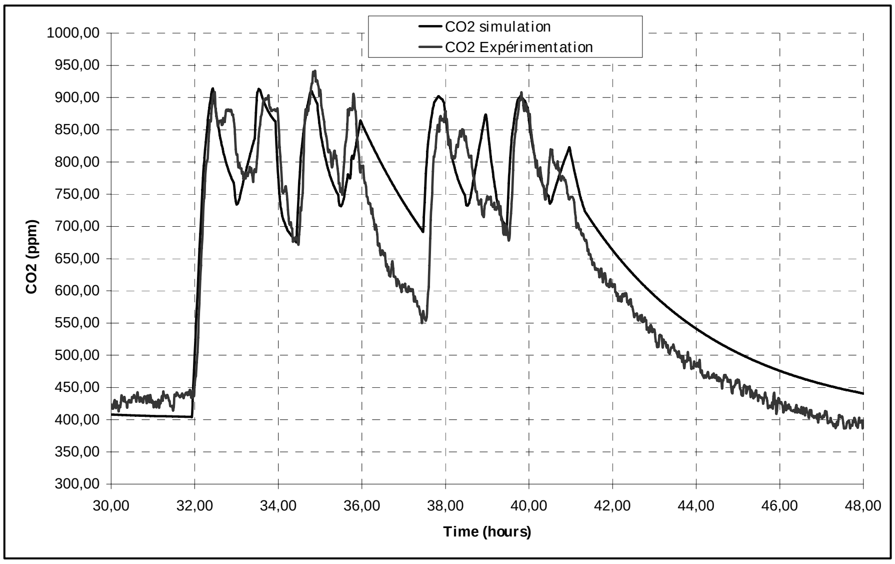


Figure 4 - IAQ hierarchical fuzzy logic based architecture results

Diffuse ceiling ventilation, a new concept for healthy and productive classrooms

P. Jacobs, E.C.M. van Oeffelen, B. Knoll, W. Borsboom

In most Dutch classrooms high draught risks result in insufficient ventilation and poor air quality in the heating season, while in the rest of the year the risk of overheating is high due to the high internal heat load. Ventilation in class rooms needs to be improved with regard to indoor air quality, draught, overheating and noise. This induces higher learning performance, less sick leave and improved well being.

In this study a new ventilation concept is proposed, in which fresh air is supplied through perforations spread over the whole ceiling surface. As a first step, the performance of this ventilation concept was tested in a laboratory setting.

The measurement results show that even at extreme conditions (11 dm^3s^{-1} per child, DT=18 K) comfort problems will not occur.

Pilot study in an existing school with diffuse ceiling ventilation

During the heating season of 2008 a pilot study was held in a classroom in the Netherlands with children to evaluate the practical implementation of the concept in an existing school. The pilot study proved that the diffuse ceiling ventilation concept can be implemented in an existing classroom. In this case the investment costs are low, because air ducts were not needed and the existing lowered ceiling was used. With the help of five people it took four hours to install the ventilation concept. Thus, both the investment costs and inconvenience for the school are limited.

The ventilation rate is controlled on the basis of the occupation of the classroom by using CO_2 control (set point 1200 ppm). Both by designing on low pressure drops and by the CO_2 control the energy costs can be kept minimal.

In a reference classroom CO_2 levels up to 2700 ppm are reached, while in the pilot classroom the levels stay beyond the set point of 1200 ppm. These results are in agreement with the results of a weekly held questionnaire: in the reference classroom the air is rated as ‘not fresh’, while in the pilot classroom the air is rated as ‘fresh’.

Capacity dm^3s^{-1}	L_p dB(A)	Pressure drop Pa	Energy W
180	28	6	8
390	41	60	50
610	53	144	172

The table shows results of instantaneous measurements.

The results show that with modest investment costs, extremely low fan energy consumption and a low noise level the indoor environment in classrooms may be improved considerably.

Source: Indoor Air 2008: Diffuse ceiling ventilation, a new concept for healthy and productive classrooms, P. Jacobs, E.C.M. van Oeffelen, B. Knoll, TNO Built Environment and Geosciences, Delft, The Netherlands. Contact: ____@______*

Experimental investigation of the air flow in naturally ventilated classrooms

M. Santamouris, Physics Department, University of Athens, Greece

Introduction

Many recent studies have shown that schools have significant indoor environmental problems, while ventilation levels are below the recommended rates, (Daisey et al, 2003). Ventilation levels in schools affect thermal comfort, indoor air quality and health and in an indirect way the learning capacity and the performance of students.

Inadequate ventilation in schools is found to be related to sick building syndrome, increased complaints by the students, and increasing absenteeism. Ventilation in schools may be provided by natural or mechanical means. Natural ventilation is very common in mild climates.

Most of the national regulations in mild climates do not require the use of mechanical systems and consider that window opening can provide the necessary ventilation rates. However very limited and often confusing, information is available regarding the ventilation patterns and the associated indoor air quality in naturally ventilated classrooms. In general, natural ventilation in schools is associated with lower symptom prevalence although ventilation rates may be lower than in mechanically ventilated schools, (Seppanen et al 1999).

This note presents the results of a multiyear study regarding the air flow rate in 62 classrooms of 27 naturally ventilated schools in Athens, Greece. The main aim of the present study was to investigate the parameters and the characteristics of the air flow rate in naturally ventilated schools in warm climates. In particular, to evaluate the absolute levels as well as the dynamic fluctuation of the air flow during the teaching, breaks and the non occupancy periods. Finally, to examine and analyse adaptive actions of the occupants aiming to improve the indoor environment in the classrooms. In particular, to study and understand the impact of the indoor and outdoor temperatures on the window opening and the corresponding air flow rate.

All classrooms were continuously monitored using tracer gas techniques and the air flow has been analysed. The air flow characteristics of schools using intermittent natural ventilation are examined and classified. All data are compared to existing ventilation rates using published information from 287 classrooms of 182 naturally ventilated schools and 900 classrooms from 220 mechanically ventilated schools. Adaptive actions to improve indoor environmental quality were recorded and the impact of indoor temperature on windows opening is discussed in detail.

Experimental Procedure

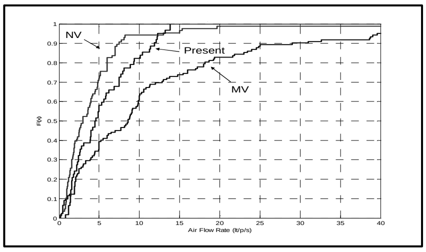
Ventilation rates in the present work were measured using tracer gas techniques. In order to assess the impact of intermittent natural ventilation techniques, most measurements were performed during the autumn and spring period, where opening of the windows is the main ventilation technique, (Mid-February to June and September to November, 2003 - 2007).

Some measurements were also performed during December and January to evaluate air flow rates and CO2 concentrations under infiltration conditions. The following strategy has been applied. For each school, when classrooms where empty and the windows closed, measurements of the infiltration rate were performed using tracer gas techniques. Then measurements were repeated during the breaks when most of the windows were opened and the classrooms were almost empty. Thus, the minimum and maximum ventilation rates were estimated. Measurements were also performed during the teaching period and the ventilation rate was measured for the specific area of opened windows. When the surface of the opened windows increased or decreased for a substantial period of time during the courses, SF6 measurements were repeated, and thus the temporal variation of the air flow was assessed. Sampling of the tracer gas was performed from at least four points in the classrooms in order to assess the homogeneity of the injected gas and estimate possible errors. The calculated errors because of the non perfect homogeneity was estimated between 4-7 %.

Air Flow Characteristics in Naturally Ventilated Schools

The air flow levels in the 62 classrooms as measured during the infiltration, teaching and the breaks period are calculated, in lt/p/sec. Air flow rates are normalised to the number of occupants during the teaching period. All values were calculated for a statistical significant level equal to 0.01. The mean flow rate during the non occupancy period when all openings were closed, (infiltration), was close to 1.5 lt/p/sec. The corresponding flow during the teaching period was close to 4.5 lt/p/sec, while during the breaks period, the median flow was around to 7 lt/p/sec.

Almost all classrooms presented a similar air flow rate under infiltration conditions, while an important variability between classrooms is found during the teaching and the break periods. In particular, during teaching the air flow varied between 2 to 11 lt/p/s, while during the breaks between 2 to 20 lt/p/sec.



Cumulative Frequency distribution of the mean air flow rate, (lt/p/sec), during the teaching period, as measured in the 62 classrooms. Also, the cumulative frequency distribution of the flow rate for the naturally and mechanically ventilated schools included in the database of published schools

To compare the present study ventilation rates measured against the existing information for naturally and mechanically ventilated schools, the cumulative frequency distribution of the air flow rates during the teaching period, (lt/p/sec), was calculated. In parallel, the corresponding cumulative frequency distributions for the naturally and mechanically ventilated schools included into the database, have also been calculated. As shown, the air flows measured by the present study are significantly higher than the ones reported for the NV schools. The median value of the flow rate in the present study is close to 4.5 lt/p/sec, while for the existing NV schools is close to 3 lt/p/sec.

In parallel, 77 % of the cases in the current study present a flow below 8 lt/p/sec, while the corresponding value for the NV schools is 95 %. The difference is mainly because almost all classrooms in the present study operated with at least some of the windows opened, while in the database of the existing NV schools there are a lot of cases with almost all windows closed. It may be said that the cumulative distribution of the present study is more representative for schools in warm climates, while the cases included in the database represent an average situation.

Comparison against the performance of the mechanically ventilated schools, shows that the measured air flows in the present study are rather lower. The median value of the flow rate in the MV schools is close to 8 lt/p/sec, against 4.5 lt/p/sec in the present study. Also, only 45 % of the MV cases are below 8 lt/p/sec, against 77 % measured by the actual study.

References

Daisey, J., Angell, W.J. and Apte, M.G. (2003) : Indoor air quality, ventilation and health symptoms in schools: an analysis of existing information. Indoor Air – International Journal of Indoor Air Quality and Climate, 13(1), 53–64.

Seppanen O. A., W. J. Fisk and M. J. Mendell (1999) : Association of Ventilation Rates and CO2 Concentrations with Health and Other Responses in Commercial and Institutional Buildings, Indoor Air; 9: 226–252.

Note

An extended version of this paper is published in : M. Santamouris, A. Synnefa, M. Asssimakopoulos, I. Livada, K. Pavlou, M. Papaglastra, N. Gaitani, D. Kolokotsa, V. Assimakopoulos: Experimental investigation of the air flow and indoor carbon dioxide concentration in classrooms with intermittent natural ventilation, Energy and Buildings, In Press, 2008.

For downloading the publications written by the AIVC, a password is needed. An automatic on-line password is available free of charge for citizens in Belgium, France, Germany, Greece, Netherlands, Norway and USA.

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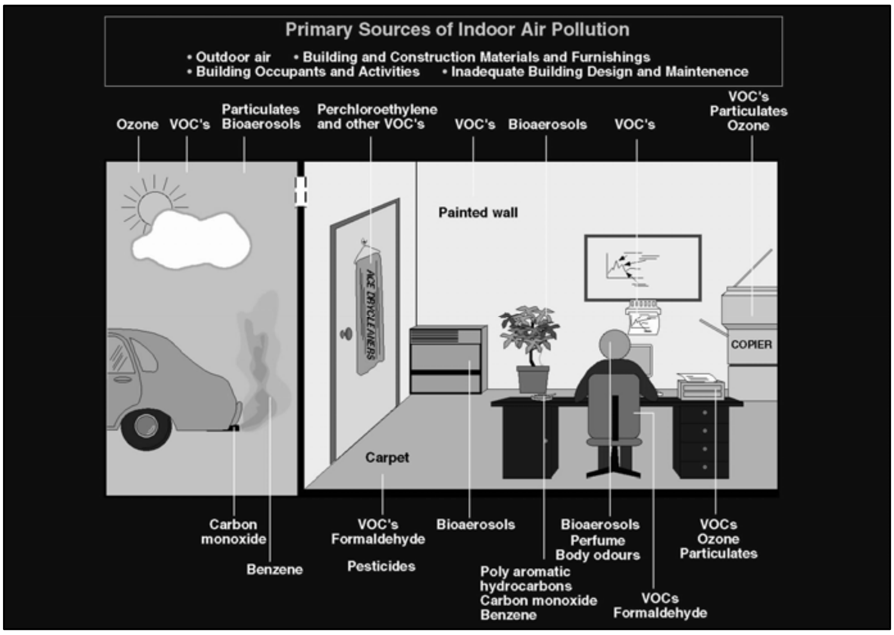
All documents marked with are available at www.aivc.org > Newsletter > 2008

Estimating indoor air quality using integrated 3D CAD building models

The Cooperative Research Centre for *Construction Innovation* in Australia has developed a software tool to assess indoor air quality - the Indoor Air Quality (IAQ) Estimator.

Current assessment of indoor air quality in buildings focuses on the measurement of pollutants to assess their compliance with recommended guidelines.

In the Indoor Air Quality (IAQ) Estimator, the pollutant emission properties of major pollutant sources in offices are used to predict their impacts on indoor air quality. This prediction is made using a software tool for building designers so that they can select materials and appliances that, in combination, are sufficiently low emitting to prevent emission goals for indoor air pollution from being exceeded.



Source: CSIRO

At the design stage, experience is the main source of information for deciding on choice of materials on the basis of indoor air quality. There does not exist any model or tool which is specifically aimed at predicting the indoor air quality of a building at the design stage, yet a method/tool for predicting pollutants would assist designers in creating optimum indoor air environments.

A method for predicting optimised indoor air quality and the use of appropriate performance measures are key prerequisites for developing a building code for indoor air quality, and to provide estimates of indoor quality from which environmental and occupant health consequences can be minimised.

The principal objectives for IAQ Estimator were:

- To create a database of air pollutant emission rates for common large-area building materials and contents, focussing on typical examples of paints, adhesives, floor coverings, plasterboard, reconstituted wood-based panels, office furniture and copiers/printers;
- ·To utilise this database to estimate the effects of different ventilation scenarios on indoor air quality for a single zone of an office building in a 3D CAD model;
- To estimate the submicrometre particle levels and urban air toxics in mechanically ventilated office buildings for different levels of urban air particle pollution, particle emissions from copiers/printers, and ventilation system filter efficiency; and
- To integrate the above three factors for estimating indoor air pollutant levels within a building zone directly from the material information available in a 3D CAD model or from information introduced manually.

A model for Indoor Air Quality in commercial buildings was developed by combining existing indoor air measurement, product emission and ventilation/filtration knowledge into a practical tool for estimating the indoor air quality of rooms/spaces over time. The estimated pollutants were for a single, fully mixed and ventilated zone in an office building.

The Indoor Air Quality Estimator is considered to be an integrated, proof-of-concept model development comprising:

- Acquisition of dimensional data for the indoor spaces from a 3D CAD Building Information Model via IFC files;
- Manual entry of building components and office equipment details when 3D CAD is unavailable;
- A methodology for estimating indoor air pollutants over time from quantities and unit emissions from large area materials, office equipment and furniture and ventilation air sources, flow rates and filtration efficiency; and
- An assessment approach based on health-based criteria for indoor pollutants.

Standalone software, which can import IFC models directly, is likely to have the most impact as the potential users are not 3D CAD specialists.

IAQ Estimator enables building designers to estimate the impacts on indoor air quality of different materials, finishes, office equipment and ventilation practices. By selecting different scenarios, the possibility of IAQ goals being exceeded can be understood, different strategies can be adopted (short-term increase in ventilation, delayed occupancy) and pollutant exposures can be reduced.

The tool has many simplifying assumptions, such as:

- A building level would be treated as one, fully-mixed zone.
- Only large-area materials are included.

- The emissions database is not extensive in the materials considered (though it can grow with applications).
- Only the 'dominant' Volatile Organic Compounds (VOCs) found in building air or product emissions are included.
- Pollutants without health-based goals are not included.
- Losses of pollutants to surfaces are not considered.
- Filtration efficiencies are for new filters.

However, in general these will lead to overestimates of indoor air pollution and so this should not be considered a fully predictive tool. The key benefit of IAQ Estimator is that it will make choices more transparent at an early stage. It is not expected to replace the need for IAQ assessment of new buildings but it should reduce the likelihood of unacceptable indoor air quality.

Overall, IAQ Estimator is:

- An office design tool for selection of materials, office equipment, ventilation filtration;
- Useful in design towards optimised IAQ;
- A tool that allows control of indoor air pollutants
  - from new materials (aimed at first 6 months of construction), and
  - from long-term factors such as office equipment, filtration system and urban air.

IAQ Estimator is not:

- A means of distinguishing a priori whether indoor air presents health risks;
- A means of predicting IAQ with precision;
- A means of dealing with all aspects of IAQ (e.g. provision/distribution of ventilation air, maintenance, indoor activities, other pollutants such as micro-organisms, combustion gases etc.); and
- A tool for use in regulations.

For more information contact P. Scuderi – ____@_______ or visit *www.*_________.

New ASHRAE standard on Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems

J. Dunlop, Public Relations ASHRAE

Maintain to sustain is the name of the game when it comes to saving energy and money in today's building stock. A new standard from ASHRAE and the Air Conditioning Contractors of America (ACCA) will help ensure a consistent minimal level of HVAC&R maintenance and inspection to preserve a system's ability to achieve acceptable thermal comfort, energy efficiency, and indoor air quality in commercial buildings.

ANSI/ASHRAE/ACCA Standard 180-2008, Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems, is the first standard to address inspection and maintenance of HVAC systems. Robert Baker, chair of the committee that wrote the standard, noted that inconsistencies exist within the building industry when it comes to inspection and maintenance of HVAC systems, with some facilities following rigorous policies while others have adopted a run-to-failure approach.

"Consistent maintenance ensures that energy efficiency remains at design levels," Baker said. "Where maintenance is neglected, energy costs rise significantly and equipment life drops dramatically. With HVAC&R systems responsible for about 60 percent of site electrical energy use, it's imperative that we provide consistent maintenance and inspection to improve energy efficiency along with thermal comfort and indoor air quality. When systems are not maintained, indoor air quality, occupant comfort and energy efficiency all suffer."

In addition, much of the information that will be required to prepare the maintenance program can be obtained from building commissioning documents, which provides a basis for identifying failures.

To order ANSI/ASHRAE/ACCA Standard 180-2008, contact ASHRAE Customer Service at 1-800-527-4723 (US and Canada) or 404-636-8400 (worldwide), fax 404-321-5478, or visit *www.*__________.

New ASHRAE standard on Ventilation Design Requirements for Health Care Facilities

J. Dunlop, Public Relations ASHRAE

Just like the right dose of medicine can improve health, proper ventilation is an integral part of patients' well-being in health care facilities.

Requirements to ensure high-quality ventilation can be found in a new standard written by ASHRAE and the American Society for Healthcare Engineering (ASHE). ANSI/ASHRAE/ASHE Standard 170-2008, Ventilation of Health Care Facilities, defines ventilation system design requirements that provide environmental control for comfort, as well as infection and odor control.

The standard is the first ANSI standard in the nation to specifically address ventilation in health care facilities and is available for adoption by various authorities for health care facility construction such as city, state and federal governments and by private national organizations such as the Facilities Guidelines Institute and the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO).

Without high-quality ventilation in health care facilities, patients, health care workers and visitors can become infected by simply breathing. "Air-transmitted pathogens can be found everywhere in poorly ventilated health care facilities," Richard Hermans, P.E., ASHRAE certified healthcare facility design professional (HFDP), chair of the committee that wrote the standard, said.

"Because these organisms are found in higher concentrations in hospitals and because patients are susceptible to them, additional care should be taken in the design of ventilation systems."

The standard addresses systems and equipment; space ventilation for a variety of areas in health care facilities, including airborne infection isolation rooms, critical care units, burn units, surgery rooms, and Class B and C operating rooms; and planning, construction and system startup.

To order ASHRAE/ASHE Standard 170, contact ASHRAE Customer Service at 1-800-527-4723 (US and Canada) or 404-636-8400 (worldwide), fax 404-321-5478, or visit *www.__________*.

New ASHRAE standard on Testing Seismic Restraints for HVAC&R Equipment

J. Dunlop, Public Relations ASHRAE

Forget what Jerry Lee Lewis said; there's not going to be a whole lotta shakin' going on with a new standard from the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). ANSI/ASHRAE Standard 171-2008, Method of Testing Seismic Restraint Devices for HVAC&R Equipment, provides manufacturers a standard way of testing such devices to prequalify products for earthquake-prone areas.

"This standard is a breakthrough for ASHRAE," says James Tauby, chair of the committee that wrote the standard. "This new national standard moves testing from the West Coast to the entire United States.

It is the first national standard for seismic restraint testing of non-structural components that does not require shaker table testing, which is the required testing form in many California projects. Standard 171 provides provide static-test procedures for determining the capacity of seismic restraints for HVAC&R equipment. These test procedures determine the maximum force a restraint can withstand without breakage or permanent deformation.

Manufacturers of vibration isolators, seismic restraint vendors and strut channels can use the standard to test their products' suitability for standing up to earthquake conditions, and consulting engineers can use the standard as a reference in specifications.

To order ANSI/ASHRAE Standard 171-2008, contact ASHRAE Customer Service at 1-800-527-4723 (US and Canada) or 404-636-8400 (worldwide), fax 404-321-5478, or visit *www.______________*.

New ASHRAE guideline on Residential IAQ

J. Dunlop, Public Relations ASHRAE

A new residential ventilation and indoor air quality (IAQ) guideline is now available from ASHRAE. ASHRAE Guideline 24-2008, Ventilation and Indoor Air Quality in Low-Rise Residential Buildings, is the companion guideline to ANSI/ASHRAE Standard 62.2-2007, Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings, the only nationally recognised ventilation and IAQ standard developed solely for residences.

Guideline 24 provides information on achieving good IAQ that goes beyond the requirements contained in Standard 62.2 by providing explanatory and educational material not included in the code-intended standard.

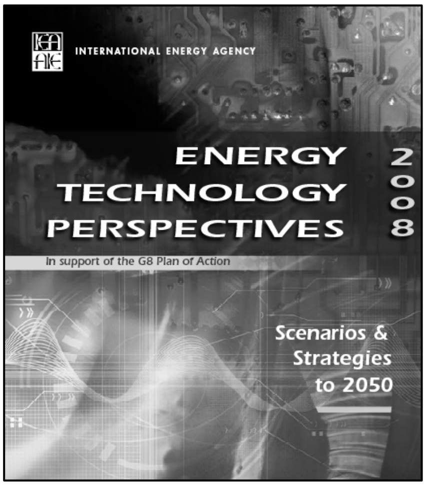
The guideline, which was written by the committee responsible for maintaining Standard 62.2, includes information on envelope and system design, material selection, commissioning and installation, and operation and maintenance.

Committee chair Steven Emmerich said, "While Standard 62.2 contains the essential minimum requirements that all low-rise residential buildings should meet to achieve acceptable IAQ, Guideline 24 is an essential resource for designers, builders and others looking for reliable information on topics not covered in the standard or seeking to go beyond minimum for high performance construction. Topics covered range from fundamentals of building airflow to humidity control to verification of equipment performance."

To order the guideline, contact ASHRAE Customer Service at 1-800-527-4723 (US and Canada) or 404-636-8400 (worldwide), fax 404-321-5478, or visit *www.____________*.

Energy Technology Perspectives 2008

This second edition of Energy Technology Perspectives addresses these questions, drawing on the renowned expertise of the International Energy Agency and its energy technology network.



This publication responds to the G8 call on the IEA to provide guidance for decision makers on how to bridge the gap between what is happening and what needs to be done in order to build a clean, clever and competitive energy future.

The IEA analysis demonstrates that a more sustainable energy future is within our reach, and that technology is the key. Increased energy efficiency, CO_2 capture and storage, renewables, and nuclear power will all be important. We must act now if we are to unlock the potential of current and emerging technologies and reduce the dependency on fossil fuels with its consequent effects on energy security and the environment.

This innovative work demonstrates how energy technologies can make a difference in an ambitious series of global scenarios to 2050. The study contains technology road maps for all key energy sectors, including electricity generation, buildings, industry and transport. Energy Technology Perspectives 2008 provides detailed technology and policy insights to help focus the discussion and debate in energy circles.

The book can be ordered here: *www.___________* or e-mail: *______@______*.

Call for abstracts

30th AIVC conference

Trends in high performance buildings and the role of Ventilation" and "International Conference on Building and Ductwork Airtightness

Berlin, Germany,

1 - 2 October 2009

The combined conferences "30th AIVC conference and Buildair – Trends in high performance buildings and the role of Ventilation" and "International Conference on Building and Ductwork Airtightness" aim to focus on key items of the present ventilation challenges.

The first theme of the combined conference "building and ductwork airtightness" has been chosen because minimising energy use for ventilation while maintaining (or even improving) the indoor climate is a growing concern. The achievement of a good building airtightness can substantially contribute to a reduced energy use. There are many interesting issues for presentations and discussions, e.g. measurement techniques, new product and system developments, measure-ment results in situ, predicting techniques, standards and regulations, economic aspects, extreme levels of building airtightness, use of infrared thermography, etc.

The second theme is high performance buildings, whereby a large scale application is planned and even started in many countries. A major challenge is the achievement of energy efficient ventilation while guaranteeing a good indoor climate (air quality, summer comfort ...). Issues of concern include the overall energy performance of high performance buildings, the comparison of energy performance requirements for those buildings with national requirements and specific ventilation issue such as heat recovery, demand controlled ventilation, source control, building airtightness, night ventilation, etc.

The topics of the conference are:

- Treatment of building and ductwork air-tightness in standards and regulations, legal aspects
- Parameters and limit values for building air-tightness
- The role of airtightness in individual countries
- Measuring instruments for building and ductwork airtightness
- Airtightness of the building envelope and of ductwork – measuring practice, interpretation of measuring results, test reports, special measurements
- Certification of measuring devices and teams, sealing compounds and buildings
- Planning of building airtightness and air-tightness concepts
- Airtightness measurement and building thermo-graphy
- Airtight building envelope and building ventilation
- Airtightness – energetic and economic efficiency
- Building airtightness and mould – structural damages
- Handling of ventilation in high performance buildings and handling of the energy performance regulations
- Energy for transport of air
- Innovative ventilation systems and energy performance regulations
- Impact of regulations on ventilation market
- Good indoor climate and energy performance
- Commissioning and inspection of ventilation systems
- Ventilation related challenges for the existing building stock
- Ventilation aspects in warm and cold climates
- Economics of indoor climate
- Trends for high performance buildings and their measured or calculated energy performance
- Comparison of energy performance require-ments for high performance buildings with national requirements

The call for abstracts will be distributed within the next month. The time plan is scheduled as following:

- Receipt of abstracts 1 March 2009
- Notification of abstract acceptance 15 April 2009
- Submission of papers 31 July 2009

Languages
English will be the official language. The parallel track "Building and ductwork air tightness" will be held in English and German. A simultaneous translation of this part is provided.

Conference organizers
The conference is organised by the Energy and Environmental Center Deister GmbH (e.u.[z.]) in cooperation with the International Network for Information on Ventilation (INIVE EEIG) on behalf of the Air Infiltration and Ventilation Centre (AIVC) and the Fraunhofer Institute for Buildings Physics (Fraunhofer-IBP).

More information will be soon available on the AIVC websites *www.aivc.org* and *www.buildair.de.*

If you like to receive further information via e-mail, please send a mail to the conference secretariat (*bildung@e-u-z.de*) and indicate "Further info on AIVC Conference 2009".

Results from the REHVA Forum "Need for ventilation guidelines and standards in Europe"

O. Seppänen,
Federation of European Heating and Air-conditioning Associations (REHVA)

The 11th International congress on Indoor Air Quality and Climate (Indoor Air 2008) was held in Copenhagen August 18-22. In connection of the congress REHVA organised a forum to discuss the need for European Guidelines and standards on ventilation.

In the introduction of the forum Olli Seppänen explained that existing standards (EN 15251, EN 13779, EN 15239) are not adequate for designing, constructing and operating the ventilation in respect of health, comfort ant productivity of occupants.

The second introduction to the topic was presented by Dr Mark Mendell from Lawrence Berkeley National Laboratory, USA. He summarised the previous forum "Can we set health-protective ventilation standards for buildings and maintain them in the face of pressure for energy conservation?", the results of the forum are summarised in the separate article in the journal.

The third introduction was done by Professor Bjarne Olesen from Danish Technical University explaining major differences between European and US ventilation standards.

About 70 experts from all over the world attended the forum and discussed five pre selected topics. The forum was chaired by Olli Seppänen from REHVA, Jarek Kurnitski from Helsinki University of Technology acted as a secretary of the forum.

Topic 1 Do we have health based evidence to set the optimum ventilation rates?
The conclusions from the discussion were:

- Evidence exists that ventilation has an effect on SBS-symptoms
- Reviews on scientific studies have shown benefits of ventilation up to 25 l/s per person
- Evidence also shows a wide variation of "optimal" ventilation rate from building to building depending on many factors such as pollution sources such as emission from building materials
- Even though two component approach (emission from occupants and from building materials) for design ventilation rates is used in standard the European standards (EN 15251) there is a need for more scientific evidence to support this approach
- Health effects depend also on outdoor air quality
- The problem really is: How to establish air quality based performance criteria for ventilation? – input data is very difficult (emission data is not usually available etc.)
- Ventilation standards and criteria are needed also for specific groups (allergic etc.)?
- Most standards are based on mixing ventilation, however, some standards give also a possibility to take into account the ventilation effectiveness and personal ventilation but this possibility is not utilised in practice
- Final consensus was that: we don't yet know enough to establish health based ventilation rates but guidelines and standards can be made for better performing ventilation

Topic 2 Why do ASHRAE 52 and CEN 15251 have so different ventilation rates for office rooms?
Prof Olesen explained the basic difference between standards. ASHRAE ventilation standard is based on occupants who are adapted to indoor air quality but the European standard is based on non adapted. For example in a 10 m^2 office ASHRAE standard leads to the ventilation rate of 8.5 l/s as the EN standard leads to 20 l/s.

Topic 3 How should the residential ventilation rates be defined?
The ventilation rates can be set alternatively 1) ach per house/ apartment 2) exhaust ventilation rates 3) vent rates per bedroom.

The conclusion was that ventilation rates should depend on the number of persons per room, and actually adaptable ventilation rates are needed. Demand control of different rooms is needed.

Ventilation should be adjustable depending on the number of occupants and pollution sources in the residence.

Topic 4 What is missing in ventilation standards?

- Guidance for easy maintenance and operation of ventilation systems
- Highly polluted outdoor air to be taken into account, and ventilation adjusted accordingly or ventilation air to be cleaned
- Addressing outdoor climate (humid/ dry), and possibility to adjust the ventilation
- Guidance is needed for demand controlled ventilation
- Noise problem is solved in standards but not in practice – also more strict noise criteria is needed
- Instructions for building occupants is needed in respect of education component

Topic 5 Do we need different standards for mechanical, hybrid and natural ventilation systems?
The conclusion was that the performance criteria should be the same but different design standards are needed. Performance criteria could be based on total exposure of some pollutants, and maybe on maximum concentration of some pollutants.
Many studies have reported more symptoms in MV-buildings but reasons are still unclear. No understanding how to the difference should be taken into account.

Final conclusion was that work for improved ventilation guidelines and standards are needed, and that REHVA should take initiatives in this area.

References
EN 15251. 2007. *European Standard*. Indoor environmental input parameters for design and assessment of energy performance of buildings- addressing indoor air quality, thermal environment, lighting and acoustics.

EN 13779. 2007. *European Standard*. Ventilation for non-residential buildings - Performance requirements for ventilation and room-conditioning systems.

EN 15239:2007. *European Standard*. Ventilation for buildings – Energy performance of buildings – Guidelines for inspections of ventilation systems.

The information on this page is provided in collaboration with REHVA, the federation of European heating and air-conditioning associations.

4th Edition of guidebook 'Understanding the Building Regulations'

Although the UK's Building Regulations are complex and lengthy, their essential features are relatively straightforward. The author, Simon Polley, brings out his brief and practical guide up to date, in line with the significant recent changes to the regulations.
Written by an industry practitioner, this practical guide is well laid out, jargon-free and easy to use. It is an excellent introduction to the UK's Building Regulations for professionals and students alike. This new edition sees full updates in line with changes to the ventilation part, fuel storage systems and fire safety. For more information go to: *www.___________*
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IBPSA's Newsletter

L. Degelman, Chair,
Public-Relations committee of IBPSA
_______@_________

The International Building Performance Simulation Association (IBPSA) regularly publishes its newsletter on its web site, *www._______*, twice per year. The web site has a collection of newsletters, covering news, events and conferences over the past 13 years. Visitors to the IBPSA home page can obtain free technical paper proceedings from the 10 International conferences held since 1987.

ASIEPI webevent - 12 December 2008

Ways to stimulate a market transformation of envelope airtightness

The IEE SAVE ASIEPI project (01/10/2007 - 31/03/2010) is analysing different aspects of the EPBD implementation. One of them is building airtightness. Envelope airtightness is indeed an important feature for low-energy, well-ventilated buildings. Germany has produced a continuous effort on this issue during the past two decades. More recently, there has been an increasing interest for this issue in some other European countries, with interesting developments to further stimulate the market.

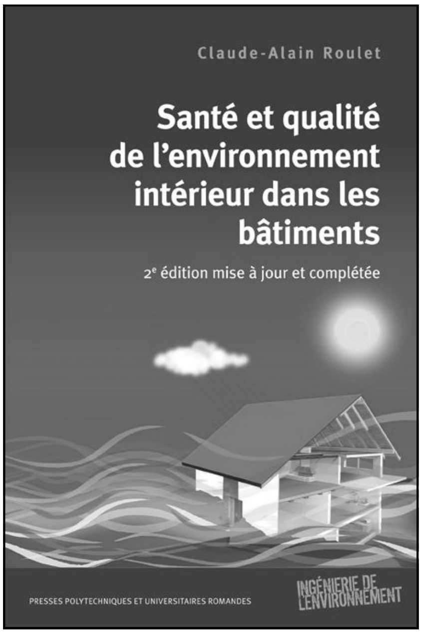
To attend, no travel… you only need your computer! The participation is free. For more information and registration, see *www.asiepi.eu*.

New publication on health and environmental quality in buildings

2nd edition - 2008
Claude-Alain Roulet

A building should be, above all, healthy and comfortable. It should be a shelter, protecting the occupants against the outdoor climate and environment and offering a good indoor environment. This aim can be achieved by passive and active ways.

Passive ways are architectural and constructive measures that naturally provide a better indoor environment quality without or with much less energy use.



Examples are:
- Improving winter thermal comfort with thermal insulation, passive solar gains, thermal inertia, and controlled natural ventilation
- Improving summer thermal comfort with thermal insulation, solar protections, thermal inertia, and appropriate natural ventilation
- Ensuring indoor air quality by using low-emitting materials and controlled natural ventilation
- Providing controlled daylighting
- Protecting from outdoor noise with acoustical insulation, adjusting the reverberation time for a comfortable indoor acoustics

Passive means are often cheap, use very little or no energy, and are much less susceptible to breakdown than active means. However, they often depend on meteorological conditions and therefore cannot always fulfil the objectives. They should be adapted to the location and therefore need creativity and additional studies from the architect, and a design error may have dramatic consequences.
Active (or technological) ways allow reaching the objectives by mechanical actions, using energy for complementing the passive ways or even for compensating low building performance.

Examples are:
- Heating boilers and radiators for winter comfort
- Artificial cooling by air conditioning or radiant panels for summer comfort.
- Mechanical ventilation
- Artificial lighting
- Actively diffusing background music or noise to cover the ambient noise.
- Active ways, when appropriately designed, built and maintained, are perfectly adapted to the needs. The architect does not have to take much care of them, since these are designed and applied by specialised engineers according to known technology. Flexible and relatively independent on meteorological conditions, they allow correcting design errors. However, the required technology is often expensive, uses much energy and may break down. Furthermore active means require careful maintenance.

Passive ways are preferred, but cannot always fulfil the comfort objectives. Therefore, the appropriate strategy is to use them as much as reasonably possible and to compensate for their insufficiencies with active systems, which will then be smaller. This strategy often allows more freedom in choosing the type and location of active systems.
The main purpose of this book is to present the passive and active ways to ensure a good thermal, acoustical, and visual comfort as well as a good indoor air quality. It also includes chapters on indoor air pollutants, and diagnosing techniques. Taking advantage of recent results from several international research programs, the author clearly shows with several examples that, with a multidisciplinary and adapted design, it is possible to erect buildings that present a great architectural quality and are both healthy, comfortable and energy efficient.

The book is available in French at *www.______________________*
______. No translation in English is currently available.

AIVC's Interview with Prof. Francis Allard

Francis Allard was interviewed by François Durier (CETIAT, France).

You are active in many fields and at many places related to ventilation, indoor air quality and energy. Could you list some of your current activities?
Last April, in Berlin, I was elected President of REHVA, the European federation of HVAC engineers associations. REHVA federates 28 national associations and around 100 000 engineers of our field in Europe. I am extremely grateful to the delegates who gave me the strong responsibility to lead REHVA actions for the next three years and I will try to do my best to contribute to REHVA's development for the benefits of European HVAC Engineers.

However, I am still full professor at La Rochelle University in France where I am leading LEPTIAB: a research laboratory of 80 members focussing on heat and mass transfers with a strong main dedication to indoor environment management. Personally I really appreciate this equilibrium between research, education and associative involvement.

You are known for works and publications about ventilation, especially natural ventilation, and indoor air quality in buildings. What are your favourite research topics? What are the main results and conclusions that you have reached in your research activities?
In fact, most of my research activities have been linked to modelling aspects. My PhD presented in 1978 was dealing with the definition of transfer functions of thermal bridges in order to introduce them in dynamic models of thermal behaviour of buildings.
Then, after two years in Venezuela where I developed a solar energy lab, I was working for more than 10 years as staff scientist at CNRS (French National Scientific Research Centre), focussing on natural and mixed convection phenomena in rooms by experimental and numerical approaches. The target was a better understanding of the coupling between the leading flows: plumes, jets and boundary layers with the indoor environment. At this time, we were mainly focussing on CFD developments, and what I used to call intermediate modelling using zonal modelling approaches. The applications were mainly focussing on the coupling of heating or ventilation systems with rooms. With such tools, we contributed also to some approaches of pollutant dispersion in rooms, natural and hybrid ventilation, and multizone air flow modelling. During one year I joined the COMIS group in Berkeley and we developed this code which represented the state of the art of multizone air flow modelling at the end of the 80's. To contribute to this international project was a very challenging and rich experience.
In 1992, I joined the board of creation of La Rochelle University.
My ambition was to create and develop a research lab as a continuum between more fundamental research about turbulent transfers or reactive transfers in porous media and the applications dedicated to the improvement of the overall quality of inhabited environments.

What I learned during the last 30 years is that research activity is a whole. There is no real research without solid basic studies, there is a constant need for new physical or numerical models in order to better understand and model our environment. But, in our field there is also a strong commitment to transfer our knowledge through the development of design tools, standards or equipments in order to improve the overall quality of inhabited spaces.

Could you explain your vision of the relationship between ventilation and indoor air quality? Can a ventilation system be based on indoor air quality targets?
In fact, most of our ventilation regulations are prescriptive; they are mainly based on air change rates imposed (as a function of number of occupants, type of room,…) e.g. 5 l/s or 10 or 20 per occupant.
They vary from one country to another or from one regulation to another in the same country without a real consistency. There is no real reference neither to the performance of the system (i.e.: ventilation effectiveness, energy consumption, comfort,…), nor to Indoor Air Quality. In fact, they do not give any added value to innovative ventilation strategies or systems and are not really motivating for innovation in this sector.

These various reasons lead naturally to a reflection about what should be a performance based ventilation design? It should obviously take into account the intrinsic performance of the systems, and also the evaluation of IAQ in terms of health and performance of the occupants. We already experienced how helpful was this kind of approach for the energy performance of buildings. Couldn't it be very useful also for ventilation?

What are the role and current projects of REHVA? What will be the challenges you intend to manage as the President of REHVA?
My vision of the role of REHVA is very clear, we have to disseminate and promote the best practice and innovation of European HVAC engineers in Europe and to the rest of the world. REHVA should become a forum and an information centre in our domain. Huge work has been carried out during the last few years and we can all appreciate how REHVA is also a reactive federation. Thanks to the previous teams, our activity has been doubling every two years and REHVA is today a recognised actor in building services and indoor environment in Europe. We are now taking the lead of the energy and environmental challenge for buildings in Europe which gives us a huge responsibility. REHVA is ready to take this challenge by promoting innovation and best practice of our engineers and industry all over Europe and to the whole world. In order to strengthen our strategy, we need to share our experience and disseminate success stories in high efficiency systems and innovative buildings. The target is ambitious; within twenty years we need to change dramatically our paradigm from building as energy consumers to energy producers. We cannot miss this opportunity but we need to strengthen our own efforts in communication and information.

To what extent is REHVA interested in ventilation and indoor air quality?
Within the next few years, the main effort of REHVA should be to support and enhance our common European energy conservation policy without any compromise to health and comfort of the users. Thus, ventilation and IAQ are playing a leading role in this domain. Furthermore, as I suggested earlier, REHVA will promote the development of performance based ventilation design and regulations in Europe.

What about the relationship between REHVA and the AIVC or other IEA programmes or annexes?
In my opinion, we need absolutely to develop a strong international cooperation all over the world in order to avoid duplication of efforts and integrate in our work any new strategy or developments. We established already a few years ago a very fruitful collaboration with the AIVC. For REHVA it is absolutely necessary to strengthen links with information platforms such as AIVC.
During the very last years, REHVA became also a more visible partner for CEN, EC (DG TREN) and other international associations like EUROVENT, IIR, Architect Council of Europe, ASHRAE… We really need this partnership in order to be more efficient and enhance new cooperation for the benefits of our members.

Apart from its links with AIVC, REHVA has until now no formal contribution to other IEA annexes or programmes. The main reason is that REHVA is not developing research but disseminating the research results. However, we are really open to disseminate IEA programme results as we are doing now for European projects.

Buildings and ventilation systems often fulfil regional or national rules or requirements. In this context, what is the interest of international co-operation or international projects?
As I said before, the only way to overcome these difficulties is a strong international collaboration. This is our shared responsibility. We, REHVA, are a non profit and a non governmental organisation, we are working only for the benefits of our professionals and the final building users.

For ventilation, and in general building regulations, vary a lot from one country to another and even in some countries from one region to another taking into account cultural or sociological differences. However, the frame and the methodology can be the same. It is the way we are dealing with energy policy for buildings in Europe, we should do the same for ventilation based on the performance evaluation.

How do you see the future of buildings and of their HVAC systems?
We are presently living a very challenging period for the building sector in general and HVAC systems in particular. It is clear that no real energy or environmental policy can be launched without a strong contribution of our domain. A huge effort is necessary to overcome this challenge but I am quite optimistic. In very few years, we can already see the benefits of the actions developed at least in Europe in order to improve the energy efficiency of buildings, a strong coordinated action has been successfully experimented and examples of best practice can illustrate it in any country. On the other hand, many R&D efforts are produced by the manufacturers to improve and certify the performance of their equipments. We are on the right track, this century will be the century of sustainable development and the building sector will be among the first to contribute.

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Latest AIVC publications

Technical Notes
- TN 64: Ventilation in Korea
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- TN 60: Efficacy of Intermittent Ventilation for Providing Acceptable Indoor Air Quality
- TN 59: Parameters for the design of demand controlled hybrid ventilation systems for residential buildings
- TN 58: Reducing Indoor Residential Exposures to Outdoor Pollutants
- TN 57: Residential ventilation
- TN 56: A Review of International Literature Related to Ductwork for Ventilation Systems
- TN 55: A review of international ventilation, airtightness, thermal insulation and indoor air quality criteria

Annotated Bibliographies
- BIB 13: Review of Literature Related to Residential Ventilation Requirements
- BIB 12: Review of Airflow Measurement Techniques
- BIB 11: Balancing Ventilation systems - An Annotated Bibliography
- BIB 10: Annotated Bibliography: Ventilation System Duct Cleaning

Guides and Handbooks
- GU 5: Ventilation Modelling Data Guide
- TP: Improving ductwork: a time for tighter air distribution systems
- GV: A guide to energy efficiency ventilation

Ventilation Information Papers
- VIP 29: An overview of national trends in envelope and ductwork airtightness
- VIP 28: IAQ and ventilation efficiency with respect to pollutants inside automobiles
- VIP 27: Trends in the Czech building ventilation market and drivers for changes
- VIP 26: Trends in the Korean building ventilation market and drivers for changes
- VIP 25: Trends in the Japanese building ventilation market and drivers for changes
- VIP 24: Trends in the Polish building ventilation market and drivers for changes
- VIP 23: Trends in the Brazilian building ventilation market and drivers for changes
- VIP 22: Trends in the US building ventilation market and drivers for changes
- VIP 21: Trends in the Norwegian building ventilation market and drivers for changes
- VIP 20: Trends and drivers in the Finnish ventilation and AC market
- VIP 19: Trends in the French building ventilation market and drivers for changes
- VIP 18: Trends in the Belgian building ventilation market and drivers for changes
- VIP 17: Trends in the building ventilation market in England and drivers for change
- VIP 16: Air quality in passenger aircraft
- VIP 15: Report of the 2nd European BlowerDoor Symposium
- VIP 14: European ventilation standards supporting the EPBD
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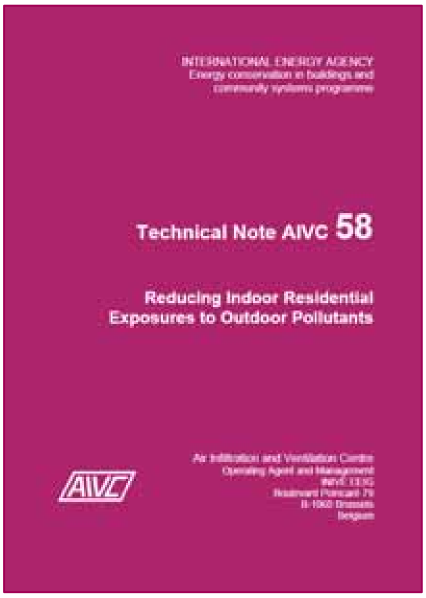

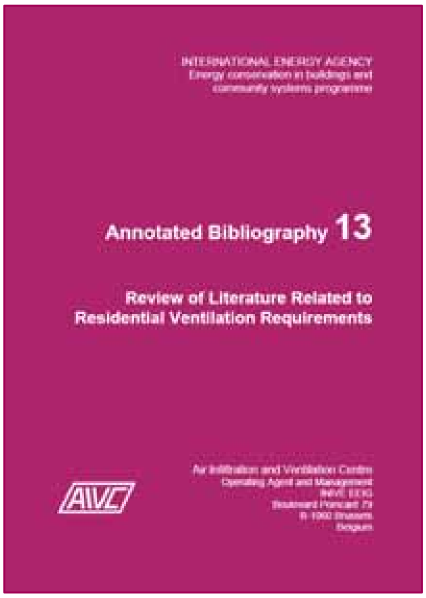

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For more information: www.aivc.org > Bookshop

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Information on AIVC supported conferences and events

Ways to stimulate a market transformation of envelope airtightness, 12 December 2008

The IEE SAVE ASIEPI project (01/10/2007 - 31/03/2010) is analysing different aspects of the EPBD implementation. One of them is building airtightness. Envelope airtightness is indeed an important feature for low-energy, well-ventilated buildings. Germany has produced a continuous effort on this issue during the past two decades. More recently, there has been an increasing interest for this issue in some other European countries, with interesting developments to further stimulate the market.
To attend, no travel… you only need your computer! The participation is free.

More information and registration, see www.asiepi.eu.

ROOMVENT Conference, Busan, May 2009

The ROOMVENT 2009 conference from 24 to 27 May 2009 in Busan, South Korea is the leading event in the area of air distribution in rooms. A wide range of topics will be covered including modelling, simulation, design, control and applications of the air distribution systems and buildings.

More information: www.roomvent2009.org

EERB-BEPH Conference, Guilin, May 2009

The Fifth International Workshop on Energy and Environment of Residential Buildings (EERB) and the Third International Conference on Built Environment and Public Health (BEPH) will be held from 27-29 May 2009 in Guilin, Guangxi Province, China. It is jointly organised by the Hunan University, the University of Hong Kong and the Tsinghua University.

More information: www.chinahvacr.com/eerb

IBPSA Conference and Exhibition, Glasgow, July 2009

The 11th International Building Performance Simulation Association (IPBSA) Conference and Exhibition will take place in Glasgow, Scotland, from 27-30 July 2009. The conference highlights building simulation and one day of the conference will be devoted to practical applications, particularly focussing on simulation in practice with illustrative case studies.

More information: www.bs2009.org.uk

30th AIVC conference and BUILDAIR, Berlin, Germany, 1 - 2 October 2009

The combined conferences "30th AIVC conference and Buildair – Trends in high performance buildings and the role of Ventilation" and "International Conference on Building and Ductwork Airtightness" aim to focus on key items of the present ventilation challenges.

More information: www.aivc.org and www.buildair.de

Call for papers - see page 9