AIR INFORMATION REVIEW

VOL 30, No. 2, March 2009 A quarterly newsletter from Air Infiltration and Ventilation Centre

Canada will join the AIVC

We are pleased to announce that Canada is finalising the process to join the AIVC as an active member country. The membership will start in the summer 2009. Canada has a long tradition and experience in energy efficient ventilation as well as healthy buildings and it will surely result in increased output by the AIVC.

The representative in the AIVC Steering Group will be Morad Atif, Director, Indoor Environmental Research Program, Institute for Research in Construction, National Research Council.

New report on hygiene and energy performance of rotary heat exchangers

P.G. Schild - SINTEF Building & Infrastructure
A.J. Petersen & I.H. Bryn - Erichsen & Horgen AS

A new report gives rotary heat exchangers a clean bill of health, but points to many critical areas related to dimensioning, installation, commissioning and maintenance of rotor air handling units (AHU) and fresh air inlets.

The energy performance requirements in the new Norwegian building regulations (2007) assume ventilation heat recovery with an annual heat recovery efficiency of 70%. This level of efficiency is best achieved with regenerative heat exchangers (e.g. rotary heat exchangers), since recuperative heat exchangers (e.g. crossflow or contraflow plate heat exchangers) incur considerable defrosting energy in winter. However, there is still some uncertainty about the true performance of rotary heat exchangers, most notably the risk of contamination of the supply air with pollutants in the exhaust air stream, especially in combination with condensation.

With this background in mind, the education authorities in Oslo (*Undervisningsbygg* and *Utdanningsetaten*) commissioned a comprehensive study to provide a scientific basis for determining the suitability, and conditions for use, of rotary heat exchangers in schools.

The following topics were given special attention:
- unwanted recovery of pollutants (particles or gases), and the consequences
- hygienic consequences of condensation in the rotor
- true energy efficiency compared with the AHU manufacturer's documentation

The project collaborators conducted a comprehensive field study of 5 AHUs in schools, with regard to hygiene, indoor environment and energy efficiency. All the tested units had a purge sector, which reduces the risk of recirculation of contaminants into the supply air stream.

The methods that were used included hygiene inspection (*HygMik* method), microbiological samples, dust composition (electron microscope and chemical study), particle counter measurements, tracer gas tests, differential air pressure measurements, air temperature and humidity in all air streams (figure). In addition, numerical simulations were conducted of energy performance (the consequence of imbalance), and the extent of condensation in the rotor.

Measurement of efficiency and air recirculation in a large ventilation unit

Main conclusions from the report:

- Systematic errors were observed in dimensioning and on-site commissioning, with respect to the pressure conditions and air flows required to account for the necessary air flow through the purge sector. For example, it seems to be common practice to balance the flow rates through the supply and exhaust fans (both with venturi inlet flow sensors) - but without accounting for the fact that the exhaust fan should have a higher flow rate to account for the purge sector. The resulting flow imbalance causes exfiltration though the building envelope. One of the units even had an incorrectly installed purge sector, such that it increased contamination of the supply air.
- The manufacturers' product documentation of temperature efficiency is credible, but assumes ideal operating conditions (balanced supply and exhaust flow rates). Heat recovery efficiency deteriorates significantly if one takes into account the imbalance between the supply and exhaust mass flow rates, which in these schools accounted for a reduction of up to 14%. This seems to be a systemic problem caused by the point above.
- Routines for monitoring and maintenance must be followed more stringently, with respect to both cleanliness/moisture and operating conditions (especially purge sector and pressure conditions). In order to limit internal air leakage, the air pressure in the AHU should be positive in the supply air stream relative to the exhaust air stream (both before and after the rotor), and at the same time there should be a satisfactory air pressure differential across the purge sector. Four of the tested units had a negative pressure in the supply fan module, and unsatisfactorily low pressure over the purge sector. This can impair both IAQ and true heat recovery efficiency.
- Recirculation & leakage of exhaust air back to the supply air was 0.2 to 1.4% if we disregard recirculation outside the building (from exhaust outlet to the fresh air inlet, which was 8.3% in one building), and ignoring the unit with the incorrectly mounted purge sector.
- The filtered exhaust air generally had a higher particle load than the filtered inlet air. Any air recirculation thus served only to reduce the particle load in the supply air.
  Two schools had activated coal filters, which performed well, especially with the filter installed in the supply air stream after the supply fan.
- The air inlet was a recurring hygienic problem area in the AHUs in this study. Three of the 5 AHUs had indications of standing water in the inlet duct, which increases the probability of health related problems for the occupants.
- Condensation hardly ever occurs in the rotor in modern schools with a ventilation rate of 20 (m³/h)/m²floor. Condensation risk increases at lower air quantities [8% of the year if the ventilation rate is 10 (m³/h)/m²], but the bulk of this condensation is recovered as water vapour in the supply air stream, only approx. 1% is blown out in liquid form in the exhaust air.
- Rotary heat exchangers are suitable for all premises where the exhaust air does not contain fat, solvents, strong odours, excessive amounts of dust, or damp areas, especially with prevalent water-soluble air contaminants.

Reference

A.J.Pedersen, I.H.Bryn, P.G.Schild, E.N.Haugen, G.Nilson, K.Høydahl. *'Forhold tilknyttet bruk av roterende varmegjenvinnere i skoler'*, Oslo: Erichsen & Horgen AS, 2009. ISBN 978-82-92982-00-6

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AIR Information Review is the quarterly 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.

AIR is published by INIVE EEIG on behalf on the AIVC. INIVE EEIG is the Operating Agent of the AIVC.
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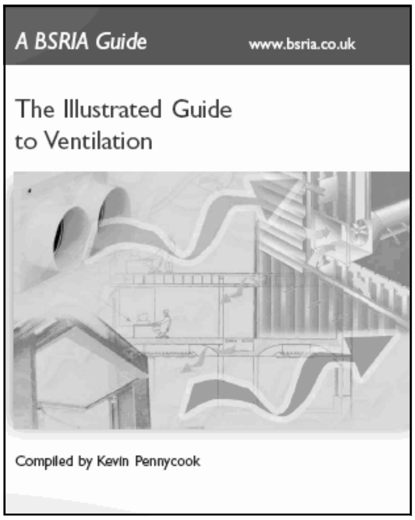
New Illustrated Guide to Ventilation

54 pages – January 2009

This new guide published by BSRIA (UK) is intended to assist technical dialogue between the client and the designing team during the briefing process, and help clients to identify and raise technical questions. For construction professionals, the guide provides a quick reference to effective mechanical, natural or hybrid ventilation systems.



Can be purchased at www.________
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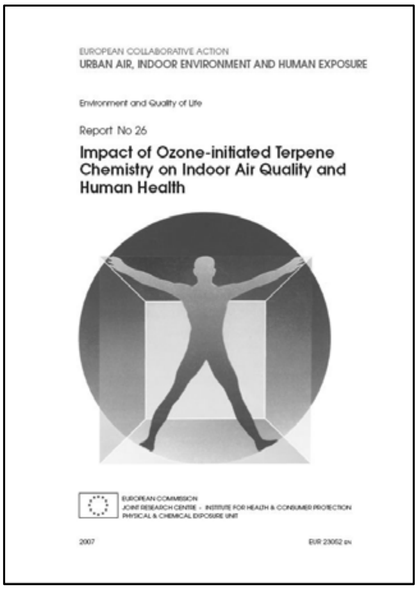
Two new ECA reports available

For more than 22 years now the European Collaborative Action ECA "Indoor Air Quality & it's Impact on Man" has been implementing a multidisciplinary collaboration of European scientists the ultimate goal of which was the provision of healthy and environmentally sustainable buildings. To accomplish this task, ECA is dealing with all aspects of the indoor environment including thermal comfort, pollution sources, the quality and quantity of chemical and biological indoor pollutants, energy use, and the ventilation processes which all may interact with indoor air quality.

All 26 ECA reports are available free of charge on the AIVC website: www.aivc.org/ECA/eca_introduction.htm

These two reports have recently been added to the site:

- **Impact of Ozone-initiated Terpene Chemistry on Indoor Air Quality and Human Health**
  (87 pages)
  This report summarises the state of the art concerning ozone-initiated chemistry and its impact on indoor air quality and human health and recommends prioritised research goals for the future. The focus is on terpenes (e.g., limonene, α-pinene) for reasons of high chemical reactivity and abundance.
- **Strategies to determine and control the contributions of indoor air pollution to total inhalation exposure (STRATEX)**
  (79 pages)
  This report collates the respective information and describes the strategies to determine population exposure to indoor air pollutants. Its major goal is to emphasise the importance of the contribution of indoor air to total air exposure.



AIVC Conference Proceedings and Publications available on CD-Rom

A new AIVC Publications CD-Rom is now available.
It contains: 52 Technotes, 6 Guides, 13 Annotated Bibliographies, 30 Information Papers and 11 Contributed Reports published between 1981 and 2008.

Ten years of AIVC conference papers are also available on CD-Rom (1998-2007) for a total of more than 800 papers.

See order form on page 15.

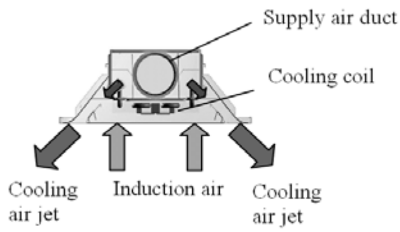
The International Journal of Ventilation March 2009

The International Journal of Ventilation was first published in June 2002 and is aimed publishing papers on ventilation research and development.

Topics include:
- New ideas concerned with the development or application of ventilation;
- Validated case studies demonstrating the performance of a ventilation strategy;
- Information on needs and solutions for specific building types including: offices, dwellings, schools, hospitals, parking garages, urban buildings and recreational buildings etc;
- Developments in numerical methods;
- Measurement techniques;
- Related issues in which the impact of ventilation plays an important role (e.g. the interaction of ventilation with air quality, health and comfort);
- *Energy issues related to ventilation (e.g. low energy systems, ventilation heating and cooling loss);*
- Driving forces (weather data, fan performance etc).

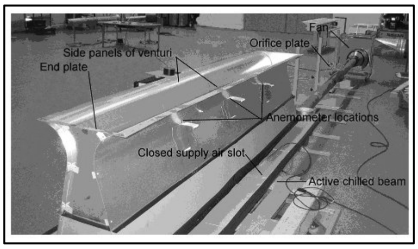
Papers published in the March 2009 edition are:

P1 - Plane-Air-Jet Corner Zone Modelling in a Room Ventilated by an Active Chilled Beam
Cao G, Kurnitski J., Ruponen M., Mustakallio P. and Seppänen O.
The most critical zone in which people often suffer draught sensation is located near a wall and close to the floor. To avoid the draught sensation from a chilled beam unit (figure), the critical velocities of the returning air jet should be specified and determined before the jet enters the occupied zone. In this study, the velocity of the attached plane jet was modelled and measured at six heights and at eight different distances from the wall. This new model can be applied to estimate the possibility of draught risk and to predict the returning airflow velocity within the occupied zone at the most critical corner region.



Operation principle and airflows in the active chilled beam used in this study

P2 - A Novel Method to Measure the Air Entrainment Ratio of an Active Chilled Beam
Ruponen M. and Tinker JA.
Continuing with active chilled beams, this paper presents a new simplified method to measure the air entrainment ratio of an active chilled beam or induction unit using a single anemometer and a simple purpose built measurement venturi (figure below). Results were compared with those obtained using European Standard prEN15116 and shoed good agreement.



Photograph of venturi showing calibration arrangement

P3 - Wind Turbulence and Multiple Solutions for Opposing Wind and Buoyancy
Etheridge DW.
The modeling of wind and stack ventilation presents complex problems that still require much analysis. In this paper the case of a simple naturally ventilated building with two openings, uniform internal temperature and opposing wind and buoyancy forces is revisited. In particular, it is shown that the effect of wind turbulence can play a deciding role on whether or not multiple solutions occur. It is also argued that in practice the number of possible solutions is three rather than two.

P4 - Stream Tube based Analysis of Problems in Prediction of Cross-Ventilation Rate
Kobayashi T., Sagara K., Yamanaka T., Kotani H., Takeda S. and Sandberg M.

The theme of theoretical modelling is also considered in this paper in which the problems associated with the conventional method for predicting cross-ventilation flow rate were analysed. There are two kinds of error, namely the underestimation of the discharge coefficient and the overestimation of the driving pressure. The discharge coefficient was determined using two kinds of chamber method. These were the conventional method using a single opening and an advanced method incorporating a model with inlet and outlet openings. The value of the former discharge coefficient was much smaller than that based on the actual condition of cross-ventilation. It was also shown that Wind pressure coefficients based on using sealed building model data tended to result in overestimates of driving pressure in the case of extremely large openings. This is because the pressure inside the stream tube becomes larger on the leeward side of a porous building than of a sealed building. It is concluded that this effect is negligible for building porosities up to at least 21 %.

P5 - Development of Effective Ventilation System for Electric Multiple Unit (EMU) Train For Mumbai Suburban Railway
Sehgal PC., Malhotra AK. and Kapoor A.
Occasionally the IJV publishes papers related to transport ventilation. In this case a new ventilation system designed (and now being installed) to deal with the extreme overcrowding (figure) of the Mumbai suburban railway system is described. This paper contains an interesting history of ventilation developments and outlines the measurements made in order to introduce a new solution.

Overcrowding on the Mumbai suburban railway system

Written in collaboration with the International Journal on Ventilation

P6 - Integrating Active Thermal Mass Strategies with HVAC Systems - Dynamic Thermal Modelling
Warwick DJ., Cripps AJ. and Kolokotroni M.
Active thermal mass can be used to enhance the performance of thermal mass through integration with HVAC systems. Dynamic thermal modelling is required in most cases to accurately determine the performance of its integration with the environmental systems of the building. This paper describes the use of a commercially available dynamic building thermal program to construct models for active thermal mass strategies and compare the results with monitored temperatures in buildings incorporating the strategies in the UK. Based on the results, a simple Excel based tool (TMAir) was developed for concept design analysis. This tool is described briefly and is available in the public domain.

P7 - Roof Thermal Design for Naturally Ventilated Houses in a Hot-Humid Climate
Su B. and Aynsley R.
Roof thermal performance is one of the most important factors for achieving indoor thermal comfort in a tropical house designed for natural cross ventilation. This study, based on field study data, discusses roof design strategies for a hot-humid climate by investigating the impacts of roof thermal performance on indoor thermal comfort in a naturally ventilated house. The paper shows that it is important to limit day-time solar heat through the roof structure in order to limit the day-time ceiling surface temperature to < 4 °C above indoor air temperature. Secondly it is important to promote heat loss through the roof structure by long wave radiation to the sky after sunset. Unfortunately bulk (conventional) insulation in a roof not only limits day-time solar heat gain but also limits heat loss through roof structure after sunset. However, a roof with reflective insulation works like a one-way thermal resistance valve, which has high thermal resistance to day-time downward heat flow and low thermal resistance to night-time upward heat flow through the roof structure. Roof colour is a further design factor for roof thermal performance in a hot humid tropical climate.

Written in collaboration with the International Journal on Ventilation

P8 - Book Review – Tropical Urban Heat Islands
Nyuk Hien Wong and Yu Chen
This book considers the issue of thermal comfort. The authors point out that temperatures in the tropics are easily above the comfort zone as defined for temperate climates. Despite this the authors advocate the use of natural ventilation. This, they argue, is because evidence shows that tropical architecture enables fairly comfortable thermal conditions to be achieved. They also state that sick building syndrome is more easily found in air-conditioned buildings. The authors express concern that much modern architecture is based on imported or "transplanted" designs from temperate climates. Very importantly, this failure to recognise tropical conditions means that passive measures to control indoor climate in these buildings are not possible and that full reliance must be placed on air conditioning. Many practical solutions are outlined and the book also devotes much space to describing how vegetation can be used on both an 'urban park' basis and on an individual building basis to reduce temperature. Although addressing the tropics, this book has applications for highly urbanised areas in almost any climate and should therefore prove to be of value to architects, developers, designers and policy makers involved in urban planning.
Subscription information and full copies of these papers are available online at www.______________.

Can airtightness in timber frame dwellings be planned?

Sverre B. Holøs
SINTEF Building & Infrastructure

The new Norwegian Building Code of 2007 stipulates an airtightness for low-rise housing of n_{50} ≤ 2.5 air changes per hour at 50 Pa differential pressure (ACH50). Worse airtightness is only permitted if the building's calculated energy performance is calculated and found to be within given limits, but it must still never exceed n_{50}=3.0.

The established literature on airtightness generally indicates that there is a great variation in the airtightness of similar buildings, and that measured airtightness tends to differ significantly from predicted/calculated values collated from known properties of components and materials used.

Air leakage data commonly exhibits log-normal distribution with standard deviation close to the median (ref. AIVC Technical Note 44). However, newer houses tend to be tighter, with less variance (Sherman & Matson).

Figure 1
Jåtten Øst housing development near Stavanger, Norway

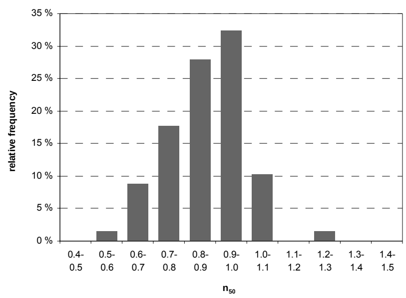


Figure 2
Frequency distribution of n_{50} measured in early airtight stage of construction of 68 houses

In a new housing development of 73 semi-detached houses in Stavanger, Norway (Figure 1), airtightness (n_{50}) was measured twice: with wind-barrier only, and again in the finished houses. With the wind-barrier only, a median of 0.88 ACH was achieved, with a standard deviation of 0.13. The distribution approximated to a normal distribution with the right-hand tail cut off just below 1.0 ACH, which was the required airtightness of the project (Figure 2). Up to 1½ hours of work to improve airtightness were done during depressurisation when initial leakage testing indicated that a house was leakier than required. This explains the cut-off of the right-hand tail of the distribution. Furthermore, it was found that expected n_{50} levels could be estimated satisfactorily based on material and component data, and some assumptions for details for which laboratory data were unavailable. These calculated levels were comparable with actual measured values. A more detailed analysis of these data will be published shortly.

Based on the experience from this study, and from measurements in other low-energy dwellings, it was hypothesised that some meaningful predictions of airtightness can be made based on air-leakage data for materials, components and joints, and adjusted for the experience of the craftsmen. This is in agreement with Perera *et al*. (1997) who suggest that airtightness of large commercial buildings can be predicted by building characteristics.

It is believed that these predictions will be meaningful if and only if airtightness at a certain level is accepted as a goal for the building project, and that the building envelope is covered in layer of wind-break material that is intended to be continuous.

To test this hypothesis, a new project collecting more data from buildings under construction has been initiated. If meaningful predictions can be made, it is intended to develop a tool for planning and reporting building airtightness. Even if the precision of the predictions is found to be less than desired, such a tool could be useful when comparing the cost-efficiency of different methods for achieving airtightness, when relevant empirical air-leakage data is incorporated in the model.

The Norwegian State Housing Bank financially supported the project in Stavanger, and the Norwegian Housing Manufacturer Association (Boligprodusentene) supports the development of a tool for predicting and reporting airtightness.

References

Sherman M.H.; & Matson, N.E.
"Air Tightness of New U.S. Homes", LBNL report LBNL-48671, 2002
Perera M.D.A.E.S.; Henderson J.; Webb B.C.,
"Predicting Envelope Air Leakage in Large Commercial Buildings Before Construction", in Proceedings:
18th AIVC Conference, 1997

ASHRAE Meets in Chicago

Update on Standard 62.2

S.J. Emmerich,
Chair of ASHRAE SSPC 62.2 Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings

More than 2800 people attended ASHRAE's Winter Meeting which was held in January in Chicago. The technical program (theme: Sustainable Urban Design) included well-attended sessions on Standard 189.1P Design of High-Performance Green Buildings Except Low-Rise Residential Buildings, CO_2 sensors and demand-controlled ventilation, building energy labeling, innovations in mechanical systems for high-rise buildings, commercial building re-tuning, air filtration for sustainable buildings, variable speed pump applications for energy savings, and building information modeling and performance analysis.

ASHRAE SSPC 62.2 Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings met on January 23rd and 24th. The committee voted to recommend several addenda for public review and discussed other important technical topics.

Chief among the proposed new addenda is the addition of alternative compliance options for existing buildings. Application of Standard 62.2 to existing buildings has been a topic of discussion within the committee for years. The Standard has always included existing buildings within its scope but has offered little special consideration for unique obstacles faced in applying it to these buildings. Urgency was brought to the issue by the proposed (and since passed) American Recovery and Reinvestment Act – commonly called the 'stimulus package' in the U.S. – which includes $5 billion for weatherisation of more than 1 million homes.

Since tightening building envelopes is a core feature of weatherisation, the issue of providing proper ventilation in weatherised homes is critical to avoid causing indoor air quality (IAQ) problems while saving energy.

Proposed Addendum e to Standard 62.2-2007 adds an appendix to allow some optional compliance pathways that will only be applicable for previously occupied buildings. The major focus is to overcome the barriers that exist to application of the standard in existing buildings.
Specifically, many requirements that are easy to meet at the original design and construction stage may be very difficult or unreasonably expensive at the retrofit stage, such as the selection and installation of conforming equipment.

To that end, this appendix offers some options that allow more flexibility. The biggest conceptual change is to allow alternative methods, such as operable windows and increased whole building ventilation, for meeting the local exhaust requirement in kitchens or baths that do not already meet the current Standard requirements.

Four other addenda were recommended for public review including the following changes:

- Allowing linear interpolation in Table 4.2 which provides factors to modify the continuous mechanical ventilation rate for systems designed to operate intermittently. This change enables potential energy-saving ventilation strategies such as night-time ventilative cooling.
- Deleting informational appendices on Operations and Maintenance and HVAC Systems. The current content of these appendices is now included in ASHRAE Guideline 24, which was published in 2008, and will be maintained there.
- Adding a new requirement for doors between dwelling units and common hallways of multifamily buildings to be gasketed or made substantially airtight to prevent transfer air from those potentially-contaminated spaces. The committee continues to study other possible changes for multifamily buildings such as a compartmentalisation requirement.
- Clarifying the language of Section 6.1 on transfer air to make it appropriate for application to both new and existing buildings.

Finally, the committee continues to study the possibility of addressing the differences among ventilation system types by including a system factor multiplier which would alter the required mechanical ventilation rate to a dwelling unit. A modeling study utilizing the CONTAM multizone IAQ program has been completed to examine various factors such as envelope airtightness, climate, exhaust vs. supply vs. balanced systems and mixing or distribution of ventilation air in a dwelling. As part of this potential change, the committee discussed increasing the mechanical ventilation rate while eliminating or modifying the default infiltration credit that is currently assumed. However, no consensus on such a change was reached at the Chicago meeting.

Additional information on ASHRAE Standard 62.2 and other ASHRAE standards is available at www.______________.

Ozone Reductions Using Residential Building Envelopes

I. Walker, Lawrence Berkeley National Laboratory

Ozone is an air pollutant with significant health effects. A significant source of ozone in some locations is outdoor air. Exposure to outdoor ozone is best avoided by reducing the metabolic rate and sheltering indoors. If indoor levels of ozone could be reduced this would lead to improved health for many California residents. There is the possibility that ozone may be effectively filtered by building envelopes and that particular ventilation systems and envelope characteristics may lead to better filtration. Laboratory studies have indicated that a reduction of outdoor ozone entry during air leakage can occur. The magnitude of this reduction depends on the specific building materials that the air flows over and the geometry of the air flow paths through the envelope. This is linked to the effect that different mechanical ventilation systems have on the air flow paths for entry of air into a building. For example, compare a continuous supply to a continuous exhaust. For the supply system, the outdoor air does not pass through the envelope – instead air enters the building via a fan and its associated ducting. In this case filtration may occur at dedicated outdoor air filters, or as deposition on the ducting used to deliver the air. For the exhaust system, air enters through leaks in the building envelope and leaves via a fan and its ductwork. In this case any filtration of air entering the building occurs in the flow paths in the building envelope. Another mechanical ventilation system characteristic is the ability to change the ventilation rate with time. In particular, the ventilation rate could be reduced during times of high outdoor ozone concentration and then increased at other times in order to meet the minimum requirements. We recently completed a study for the State of California to investigate these issues (Walker, Sherman and Nazaroff, 2008).

Four key ventilation/filtration parameters for control of ozone entry were addressed in the study:

1. Quantity of air flow. Generally, less air flow means less ozone transported into the building. This must be balanced against the requirements of minimum ventilation requirements for dealing with indoor pollutants. In this study we assumed that ventilation was compliant with ASHRAE Standard 62.2 (ASHRAE 2004).

2. Time of operation. Ventilation rates may change with time and provide the same indoor air quality so long as various criteria are met. This allows for the possibility of reduced ventilation rates at times of high outdoor ozone concentrations, with increased ventilation at other times. Since urban ozone exhibits a strong diurnal profile, this strategy may offer a practical means to improve indoor air quality and reduce energy use.

3. Air flow path. This includes details of air flow geometry for air flowing through the building envelope (including cracks, ducts, supply air filters, etc.) and relating envelope construction details to air flow path geometry and deposition. This changes the potential for deposition in the various air flow paths.

4. Flow path materials. Laboratory testing has shown that different materials have various reactions with ozone and therefore have differing filtration potential. For this study we looked at typical building materials and how the ventilation system operation changes the air flow path and therefore the materials in the air flow path.

The effects of these parameters were investigated using a multi-air flow path air flow simulation model. The simulations included thermal performance of the home and heating and cooling system operation.

The latter was important because of air leakage associated with the forced air duct system used for heating and cooling. We compared the simulation results to data from field studies that have shown that for houses with closed windows (this is typical in US homes for a variety of reasons including the use of air conditioning, security, noise and dust) the indoor-outdoor concentration ratio is about 0.1 with a large range from home to home of about 0.05 to 0.4.

The extent of ozone penetration through building envelopes depended on air flow velocity, crack geometry and reaction probabilities on the surface. The ozone deposition calculations for the building envelope were based on previously published work (Morrison et al., (1998) Liu and Nazaroff (2001)). Different performance parameters related to ozone removal are assigned to the different leakage paths in the building envelope depending on their geometry and construction materials. The air flow through the envelope was split among several air flow paths based on the geometry and the materials that form the walls of the crack. The removal of ozone by the building envelope was separated into two main categories corresponding to different air flow paths: flow through cracks and flow through insulation. The floor level leakage was assumed to flow through cracks and the wall and ceiling flows are through insulation.

The crack air flow paths have dimensions that can be characterised by the envelope pressure exponent. The pressure exponent for the leaks determines the characteristic dimensions and the flow velocities that are needed in the deposition calculations.

This deposition depends on the ozone reactions with the crack surfaces that could be different for each air flow path. The ozone reaction rate is about 10^{-6} for many building envelope materials such as wood and PVC, but is an order of magnitude (or more) higher for concrete and brick surfaces. Therefore, the simulations separated airflow into the building into flow through cracks in the walls and ceiling (that are dominated by air flow through insulation), and flow through floor levels leaks where one surface is the concrete foundation slab and the other is wood.

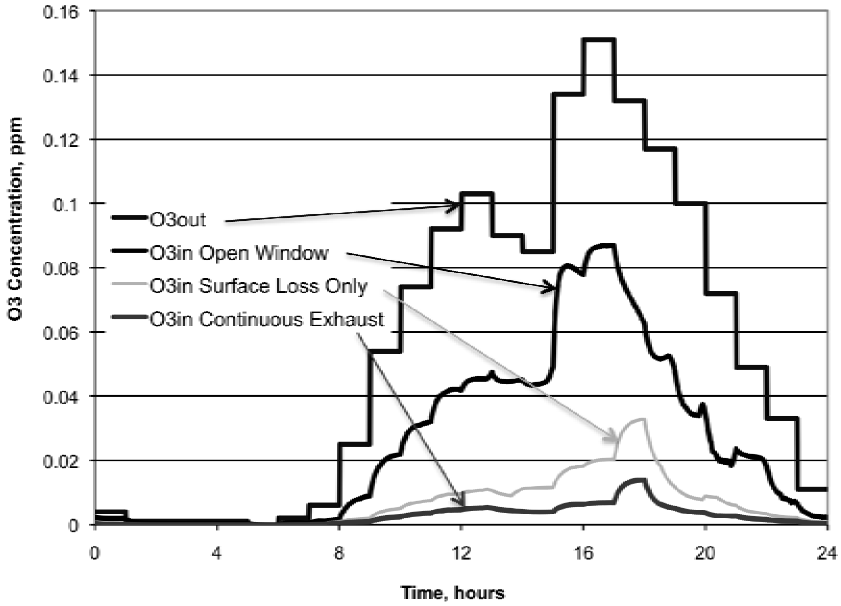
The long air flow path for wall leaks lead to no ozone penetration for these air flow paths. Comparisons to measured data showed that this would result in excess envelope filtration.

Assuming that half of the inflowing air flows bypassed the insulation gave results that compared well to measured data.

The figure is an illustration of how the indoor ozone concentrations change during a day for three cases compared to the outdoor concentration. The open window gives the highest indoor concentrations because of the high air flow rate and no filtration of ozone. The lowest indoor concentrations in the figure are for the continuous exhaust case. The intermediate results are for a case where we assumed no envelope filtration and the ozone reductions are due to indoor surface deposition only. This result shows that indoor surface reactions are important ozone removal mechanism.

The difference between this result and the exhaust result is the effect of the envelope filtration.

The results show that in each case the indoor ozone concentrations are much lower than those outside, typically about 5% of outdoor concentration on average. In general, systems that depressurize the house lead to lower indoor ozone levels. The peak levels follow the same trends.



The following five key conclusions can be drawn from these results:

1. Staying indoors is a great way to avoid exposure even with mechanical ventilation systems operating.

2. Continuous Supply limits envelope filtering and results in highest indoor concentrations.

3. The higher ventilation rate for HRV results in greater indoor concentrations

4. The reduced ventilation rates during the peak outdoor ozone periods for the economizer result in lower concentrations (about 10 hours of no mechanical ventilation credit can be taken for 6 hours of economizer operation)

5. Open windows and resulting unfiltered high ventilation rate significantly reduces benefit of being indoors.

References

- ASHRAE Standard 62.2. 2004. "Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings," American Society of Heating, Refrigerating and Air Conditioning Engineers, Atlanta, GA.

- Liu, D. and Nazaroff, W.W. 2001. Modeling Pollutant Penetration across Building Envelopes. Atmospheric Environment, Vol. 35, pp. 4451-4462. Elsevier.

- Morrison, G.C., W.W. Nazaroff, J. Alejandro Cano-Ruiz, A.T. Hodgson and M.P. Modera, Indoor air quality impacts of ventilation ducts: Ozone removal and emissions of volatile organic compounds, J. Air and Waste Manage. Assoc., 48, 941-952 (1998).

- Walker, I.S., Sherman, M.H. and Nazaroff, W.W. 2008. Ozone Reductions Using Building Envelopes. http://_________

30th AIVC conference Trends in High Performance Buildings and the role of Ventilation & 4th International Symposium on Building and Ductwork Air tightness (BUILDAIR)

Berlin, Germany - 1-2 October 2009

Scope

The combined conferences 30th AIVC conference "Trends in high performance buildings and the role of Ventilation" and "4th International Symposium on Building and Ductwork Airtightness" aim to focus on 2 key aspects of the present ventilation challenges. – Since 1980, the AIVC conferences have been the meeting point for presenting and discussing interesting developments and results regarding ventilation in buildings. For each conference a specific theme is selected and a substantial part of the presentations relate to this theme.

There are several reasons for selecting these 2 themes:

- Building and ductwork airtightness – 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, measurement results in situ, predicting techniques, standards and regulations, economic aspects, extreme levels of building airtightness, use of infrared thermography …
- There is a rapidly increasing interest in 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 issues such as heat recovery, demand controlled ventilation, source control, building airtightness, night ventilation, …

Topics of the conference

Contributions are invited regarding interesting work in the areas of research, development, application and market implementation of high performance buildings.

Preference will be given to abstracts focusing on one of the following topics:

- 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 thermography
- 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 the 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 requirements for high performance buildings with national requirements

Abstracts

Receipt of abstracts 31 March 2009

- Notification of abstract acceptance 30 April 2009
- Submission of papers 31 July 2009
- More information will be provided on the conference websites: www.buildair.de and www.aivc.org.

Venue

The conference will be held in Berlin.
Best Western Premier Hotel Steglitz International
Albrechtstraße 2 - 12165 Berlin
www.si-hotel.com

Dates

The Conference will start on 1 October and will end on 2 October.
A welcome reception is foreseen on Wednesday evening 30 September.
Technical visits and a social programme are foreseen on 3 October 2009.

Conference secretariat

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Additional information

www.buildair.de and www.aivc.org

An exhibition is organised during the AIVC-BUILDAIR conference in Berlin.

Interested companies should contact Mrs. Hollmann - bildung@e-u-z.de to obtain more information.

Development of French indoor air quality guidelines

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Y. Le Moullec - LHVP France;
J.-U. Mullot - Defense Health Service France; A.-E. Peel - French Procurement Agency France

Objectives and definition

The need to assess the possible health effects associated with measured levels of pollutants in indoor environments reveals the lack of reference levels enabling comparative assessment. Consequently implementation of policies is limited. This lack of indoor air quality (IAQ) reference levels limits also the development of standards for the characterisation of building material or consumer products emissions. Even if available ambient air reference values may be used, some compounds are quite specifically found indoors (formaldehyde for ex.) and thus have not been considered when establishing ambient air concentration reference levels. In this context, it seems to be relevant to develop specific IAQ guideline values.

According to the World Health Organization (WHO) definition, guideline values provide safe levels of pollutant concentrations below which adverse health effects are not expected to occur in general population, including sensitive subgroups (children, elders) (WHO, 2000). For genotoxic carcinogenic compounds, guideline values are expressed as risk levels corresponding to a probability of cancer occurring. Many countries already have IAQ guidelines for a few common indoor pollutants. In Europe, for example, INDEX project supported by DG-SANCO elaborated IAQ guidelines for 13 priority chemicals in 2004 (INDEX, 2005). In order to update if necessary, or to extent this approach to other compounds, the French Agency for environmental and occupational health safety (AFSSET) and the French Scientific and technical centre for building (CSTB) have been leading a working group since January 2005 in charge of developing IAQ guidelines based on human toxicological criteria. Proposed IAQ guidelines are not dedicated to occupational settings, for which specific regulations apply.

Pollutants of concern

Indoor air is characterised by a huge number of pollutants, but none of them can be considered as a global indicator of the indoor pollution. Moreover they do not all present the same interest in terms of public health concern. Therefore a list of key pollutants was established for which, on the basis of scientific knowledge, it is possible and appropriate to elaborate IAQ guideline values.

This screening was first based on assessments recently conducted by the French Indoor Air Quality Observatory (OQAI) in 2001 (Mosqueron and Nedellec, 2002) and by the INDEX project in 2004 (INDEX, 2005). OQAI prioritised the pollutants of interest to be measured indoors during its national “Housing campaign” (2003-2005) on the basis of:
(1) toxicological properties of each substance: carcinogen or not, availability of acute and/or chronic human toxicity values (HTVs),
(2) population exposure: frequency, duration and intensity. The selection criteria in the frame of INDEX were: being an individual chemical compound, having indoor emission sources, having known health effects and not being already regulated. Substances of no health concern at current environmental levels, without dose-response relationships and/ or for which the main exposure route is not the indoor air, were excluded. These two initial priority lists were crossed.
In a second step, additional criteria were used such as being an individual chemical substance (complex mixtures like short-chain chlorinated paraffins, microbiological contaminants, electromagnetic fields for example were put out the list), having no management value (asbestos and lead were excluded) and having available dose-response relationships (for example, some phthalates or brominated flame retardants do not have sufficient quantitative health data to establish IAQ guidelines).
Finally a priority list of 56 indoor pollutants of interest was established, with five groups, from high priority to non-priority substances, including one with unclassifiable substances. The first compounds (of high priority) are: formaldehyde, benzene, dichlorvos, PM10, radon, diethylhexyl phthalate, naphthalene, nitrogen dioxide, carbon monoxide, acetaldehyde, toluene, trichloroethylene, dieldrine, tetrachloroethylene, aldrin, xylenes and styrene.

Method for the establishment indoor air quality guideline values

The method developed is based on three stages for a given substance. First, the consistency of toxicokinetic and toxicodynamic data, and related effects depending on the associated durations of exposure are analysed. The No Observed Adverse Effect Levels (NOAELs) and the Lowest Observed Adverse Effect Levels (LOAELs) are listed. The critical effects for the establishment of IAQ guideline values are identified. Sensitive subgroups of populations are identified as well.
In a second step, already existing IAQ guideline values and human toxicity values (HTVs) are collected (from WHO, INDEX, US-Environmental Protection Agency, Agency for Toxic Substances and Disease Registry, Office of Environmental Health Hazard Assessment, Health Canada and Dutch Agency for environmental health). Duration of exposure, critical effects, studied populations, selected NOAEL or LOAEL, safety factors applied to derive NOAEL/LOAEL into the HTVs are specified.

Finally, IAQ guideline values are proposed depending on the two following scenarios:
- there are one or more already existing IAQ guideline values established exclusively on health considerations and/ or one or more HTVs for inhalation. Their respective quality is identical as regards to the defined criteria. The opportunity of a choice is determined on a case-by-case basis according to additional criteria (e.g. establishment date, animal or human data…);
- there is no IAQ guideline value established exclusively on health considerations, neither reliable HTV for inhalation. In that case, the working group does not propose any IAQ guideline values. Additional assessment and research are required.

Conclusion

The method elaborated by the group proved to be applicable and transparent, and was applied to formaldehyde, carbon monoxide and benzene (www.________).
Guidelines for tetrachloroethylene, trichloroethylene and naphthalene will be published in 2009.
These guideline values may now be used by policy makers to set regulatory thresholds. This work also contributes to WHO process for the establishment of IAQ guidelines initiated in 2006 and to be achieved in 2009-2010.

References

- INDEX. 2005. European Commission. Joint Research Centre (JRC). Final Report. Critical Appraisal of the Setting and Implementation of Indoor Exposure Limits in the EU: The INDEX project. Institute for Health and Consumer Protection, Physical and Chemical Exposure Unit. 337 pages. I-21020 Ispra (VA), Italy.
- Mosqueron L. and Nedellec V. 2002. Hiérarchisation sanitaire des paramètres mesurés dans les bâtiments par l’Observatoire de la Qualité de l’Air Intérieur. Final Report, in French. www.__________
- WHO. 2000. WHO Air Quality Guidelines for Europe, second edition No.91.

Latent heat storage in passive cooling of buildings

P. Charvat, M. Ostry
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A shift from heavy-mass to light-weight building structures, which occurs in many European countries, together with the improvement of thermal insulation properties of the building envelopes brings about problems with thermal comfort of building occupants in summer. The increasing use of air-conditioning in Europe and throughout the world further increases consumption of electricity in the building sector, which is already the number one consumer of electricity in the developed countries. There are no doubts that air-conditioning is unavoidable in many cases. Nevertheless, a number of buildings could be cooled in a natural way (e.g. by night-time ventilation) at least during a certain part of the year, especially in the climates with low latent cooling loads. Night-time ventilation cooling only works well when a building has a sufficient thermal mass for short-term heat storage. The load bearing structures of modern buildings generally have relatively low thermal mass and the thermal mass is often not directly exposed to the ambient air (e.g. sound attenuated concrete slab floors). The additional thermal mass may need to be added to the building structures, usually in the form of surface finishes. That is where the phase change materials (PCMs) can be employed. The phase change materials, which, theoretically speaking, are able to store heat at almost constant temperature during the phase change could become a suitable heat storage medium for night-ventilation cooling. The heat of fusion of the PCMs mostly lies in the range of 100 kJ/kg to 200 kJ/kg. With a proper selection of the melting temperature of the PCM the indoor air temperature can be stabilized at an acceptable level.

Selection of a suitable PCM is not an easy task. The wax-based PCMs do not exhibit problems of phase separation during melting. On the other hand, the wax-based PCMs usually have relatively high melting temperatures (> 30°C) and therefore are more suitable for heat storage in (e.g. passive solar) space heating than in passive cooling of buildings. The wax-based PCMs have relatively low thermal conductivity but they are non-corrosive and non-toxic. The wax-based PCMs are flammable and can pose a fire hazard in some situations. The hydrated salt based PCMs offer relatively high values of heat of fusion (latent heat) and their thermal conductivity is generally better than that of the wax-based PCMs.

The hydrated salt based PCMs contain water and have to be sealed in airtight containers as not to lose or gain water. One of the main problems with the hydrated salt PCMs is their tendency for supercooling – cooling below the melting temperature without changing the phase. The supercooling effect in hydrated salts can be considerably reduced by adding a small amount of nucleating agents which have the crystal structure similar to the PCM.

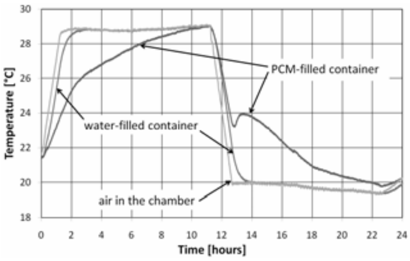

Figure 1
Experiment in the climatic chamber

Figure 1 illustrates the behaviour of the hydrated salt PCM (calcium chloride hexahydrate with a nucleating agent). Two same aluminium containers with the dimensions of 450 mm x 300 mm x 10 mm were placed in a climatic chamber. One of the containers was filled with water and the other was filled with the hydrated salt PCM (approximately 1 kg). The melting range of this PCM lies between 22 and 28 °C and latent heat is about 150 kJ/kg.

It can be seen that the temperature of the water-filled container followed very quickly the air temperature in the climatic chamber while it took more than 10 hours for the PCM-filled container to warm up or cool down to the air temperature in the chamber. Even though this experiment was rather simple, it clearly demonstrates the effect of latent heat storage. Unlike in real night-ventilation situations the air temperature in the chamber was kept at almost constant value during the charging and discharging phase. The effect of the latent heat storage in practice can be demonstrated on the results of the experiment carried out in two identical test rooms located in an attic space of a building (Figure 2).

Figure 2a
Experimental room with the PCM containers

Figure 2b
Referential room without the PCM

The external and internal structures of the test rooms consist of light-weight construction materials and the floor finishing is made of fibre-cement boards. The aluminium containers with hydrated salt PCM (the same as in the climatic chamber experiments) have been installed in one of the test rooms. The total number of the containers installed in the room is 240.

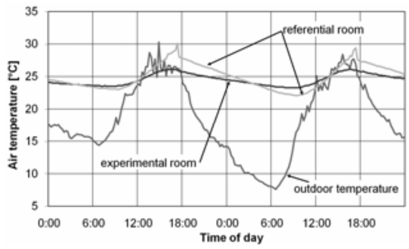

Figure 3
Temperature of indoor air in the experimental and referential room

The chart in Figure 3 shows the air temperatures in the test rooms and the outdoor air temperature. It can be seen that latent heat storage significantly reduced the peak air temperature during day. The maximum temperature in the room with the latent heat storage was 26.2° while in the referential influence it was 30.1°C. The solar heat gain through the skylights and the transmission and infiltration gains were the only heat gain to the rooms in this experiments though it is also possible to simulate internal gains.

The experiment was carried out without night-time ventilation cooling. Though test rooms were finished at the end of August 2008, it took some time to prepare equipment for night-time ventilation cooling and the weather conditions were not favourable in autumn 2009. The skylights can be opened and closed automatically by servos and there is an exhaust fan in each room to control ventilation rate (since natural ventilation might not guarantee the same air change range in each room). The night-ventilation cooling experiments are going to be performed in 2009 when the weather conditions permit.

AIVC's Interview with Dr. Kyung-Hoi Lee

Dr. Lee has completed his bachelors at Yonsei University in 1962 and received masters degrees at University College London. He obtained Ph.D in building science at Stracthclyde University, U.K in 1974.

He has been a well-known researcher and educator in the field of sustainable architecture & building science. He brought the concept of passive design and sustainable architecture into Korea in early 1970s and has contributed to spread the substantiality issues by teaching related subjects at Yonsei University and by serving as a president to a number of institutes such as Architectural Institute of Korea, Korean Solar Energy Society and Korea Institute of Ecological Architecture and Environment.

He is an honorary member of the national Academy of Engineering of Korea as well as Fellow of the Korea Academy of Science and Technology. He is also honorable fellow of American Institute of Architects and International honorary member of the Society of Heating, Air-Conditioning and Sanitary Engineers of Japan.

You have dedicated yourself to research in buildings energy and indoor environment over the past 40 years. What are your general beliefs about this field based on your expertise?

As an architect, educator and environment architect, I have worked within a wide range of research areas such as traditional architecture, climate responsive architecture, building design methodology, behavioral architecture, passive solar design, intelligent building systems, energy-efficient building design, the quality of indoor environments and eco-environmental design. My particular interests have been focused on the inter-relationships among man, environment and architecture. Building as a component of our ecosystem, it is not an independent but a dependent entity that is both environmentally sustainable and responsive to human needs.

You have done a lot of diverse research and gained a lot of valuable experience in that way. Could you briefly mention some of your achievements? What do you consider your memorable research and academic contributions in the field?

As an environmental researcher, I had been concerned in setting up mandatory regulations recommendations and codes such as building insulation standards, building energy savings plans and energy efficient building design guidelines etc. Firstly, in a sense, I have been a pioneer in architectural environmental science or environmental physics, pulling together my findings in a series of books and articles. After 25 years, this book remains as the classic textbook on architecture in Korea. Secondly, I have taught about 50 Ph.D. and 300 MSc. students who are mostly working at university & research institute in the field of environmental architecture. Thirdly, I established the Korea Institute of Ecological Architecture Environment (KIEAE) in 2001, helping to disseminate awareness of the ecological aspects of architecture and environment through various research activities and forums of global academic exchanges.
Further, the Korean Solar Energy Society successfully hosted the International Solar Energy Convention in 1997, and has run solar energy design competition since early 1990's. This has brought somehow the importance of solar energy application to building design and hopefully inspired a generation of young architects.

You are currently working as the chairman of the advisory board on environmental policy for sustainable development, the National Assembly of Republic of Korea, as well as acting as an advisor such as global warming and other related environmental issues. What are some of the hot issues in the field of architecture and the environment? In addition, what global perspectives do you have on those emerging issues?

National environmental issues always tend to run against development plans meaning that NGOs and other relevant organisations have sharp conflicts with planning. We have to put enormous effort into hosting collaborative seminars and symposiums with different non-profit organisations to help with then public understanding of the issues and as a preparation for revising and complementing existing environmental laws.

The current hot issues are looking for countermeasures for each industrial sector to respond to climate change, promoting these solutions through the related governmental committees as well as NGOs. In particular, we have to take indoor environmental issues as seriously as we do issues concerned with the atmospheric environment.
In particular, global sustainability, the diffusion of LOHAS and technological problems connected with the 'Ubiquitous Eco-City' development are all issues touching on areas of environmental concern, which will necessarily be boosted by the government's low carbon and green growth policy. In the near future, I personally anticipate that the world will turn to a large-scale Green Renaissance in order to meet the global environmental sustainability.

What are the roles of energy conservation and environmentally sustainable technology in realising healthy and green building practice?

The trend towards 'healthy buildings or green building tsunami' is now worldwide and irreversible. There has been more and more research and action plans in this area, partly brought about by the government's R&D funding as well as through the Korea Health Housing Association and Center for Sustainable Healthy Buildings currently established.

We have to face a number of growing concerns in energy conservation and sick building syndromes. Buildings are insufficiently ventilated, frequently damp and can have poor indoor air quality particularly in high rise residential buildings. This can cause mould, mites and other causes of allergy and atopy. In effect, improving ventilation standards and consolidating the regulations governing different types of harmful chemical substances can go a long way to improving the indoor environmental quality. Responding to this, a lot of collaborative researches bringing together experts from preventive medicine, health sciences and the living environment has started to frame an agenda of national and global sustainability, energy and resource use. Sustainable environment technology, though, and the planning that comes with it, will be essential in achieving the healthy building and better living environment.

Recently, 'Green Home' for zero energy building project, hybrid ventilation system and eco-environmental architecture or green buildings have became a major theme of research in Korea. Could you briefly explain some of the main research activities connected to these themes?

Energy saving in building began early in the 1980s with the introduction of new standards for insulating materials, according to the local climate. At the same time, a requirement was introduced for an energy conservation plan to be submitted in the review of a building's design permission. The next step was to bring in an energy efficiency rating system, which has been in place since 2001; recently, too, certification systems have come for the indoor air quality and for environmentally safe building materials (from 2001). Legislation was further passed in 2005 stipulating a minimum indoor air quality in multiple use buildings (2005). Besides grading building materials for their environmental standards, Korea has introduced a certificate system for indoor environment performance as well as, certificate system of Intelligent Building Systems in 2007.

Along with these systems, government research institutions such as KICT (Korea Institute of Construction Technology), KIER (Korea Institute of Energy Research) etc. and other university-sector and private research centers are actively at work on ways to improve the supply chain for environmentally friendly products.

Could you possibly give any suggestions or advice for the energy and environmental experts currently involved in ECBCS and AIVC?

Experts are undoubtedly more important than ever in creating healthy and safe immediate living environments that allow people to enjoy their quality of lives. We can then ask of the building environmental experts a great deal of 'social accountability' in their design of the indoor environment. You have to remember that the indoor environment performance, significantly and directly influences a resident's health and quality of life.

What are your future vision and plans?

Every one of us will have to deal with enormous environment changes. Creating and reforming environments will be inevitable as people seek to carry on living in an organised and civilized way. Furthermore, we have an obligation to try to reduce the negative effects of previous unsustainable uses of energy and resources, that is, seeking to regenerate some of the damage we have made to natural resources. This is a duty that we owe to the next generation.

Believing in this, the Korea Research Institute of Eco-Environmental Architecture, a non-profit organization, was founded in 2004 and has put enormous efforts into diffusing a culture of environmental awareness in architecture. Its projects have been my continuous concern for the last 40 years and will, I believe, continue to be so throughout the time I have to research environmental issues in innovative building design.

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IBPSA (International Building Performance Association) News

L. Degelman, Chair,
IBPSA Public Relations Committee

A. The SimBuild2008 conference, hosted by IBPSA-USA, was held in the late July of 2008 at the University of California, Berkeley. PDF copies of the several papers that are listed below may be of interest to AIR readers, and are available for free download at the conference website, www.________ ____________________. In addition, PDF copies of the PowerPoint presentations are also available on the same website.

- The role of wind in natural ventilation simulations using airflow network models by J. Good and A. Frisque (R. Williams Davies & I. Inc., Vancouver, BC, CA) and D. Phillips (R. Williams Davies & I. Inc., Guelph, ON, CA)
- Coolvent: a multizone airflow and thermal analysis simulator for natural ventilation in buildings by M.-A. Menchaca-B. and L. Glicksman (Massachusetts Institute of Technology, Cambridge, MA)
- Validation and parametric analysis of energyplus: air flow network model using Contam by S. Dutton (University of Nottingham, Nottingham, UK), L. Shao (De Montfort University, Leicester, UK), and S. Riffat (University of Nottingham, Nottingham, UK)
- Modeling of underfloor air distribution (UFAD) systems by T. Webster and F. Bauman (Center for the Built Environment (CBE), UC-Berkeley, CA), F. Buhl (Lawrence Berkeley National Laboratory (LBNL), Berkeley, CA), and A. Daly (Taylor Engineering, Alameda, CA)
- The energyplus UFAD (UnderFloor Air Distribution) Module Qing A. Liu (Ove Arup & Partners, San Francisco, CA), and P. F. Linden (University of California, San Diego, U.S.A)

B. In other news, IBPSA-USA has formed a new, and quite active, sub chapter in New York City. The new chapter, IBPSA-NYC, seeks to act as a forum and a resource for those interested in performing and utilizing building simulation services. The inaugural of IBPSA-NYC was successfully held on 15 September 2008 and attended by more than 50 people.

The chapter has goals of: liaising with local chapters of USGBC, NYSERDA, NATIONAL LABS, and ASHRAE, collaborating on related programs and events held in the region, holding quarterly social gatherings where professionals can do networking and discuss industry trends, establishing workshops and technical discussions on simulation related topics, and engaging students and design professionals who want to know more about building performance simulation.

Since its initial formation, IBPSA-NYC has had a Technical Committee meeting on Energy Modeling in New York on 8 January 2009, and plans yet another General Chapter meeting on 6 April 2009.
For more information about IBPSA-NYC or to make contacts, please visit www.__________.

C. For additional insights into IBPSA's activities, Worldwide Affiliates and the downloadable Newsletters, please visit IBPSA's home page at www._____.

15th International Conference

Thermal protection of buildings

Low Energy Buildings
20-21 May 2009
Slovak Republic, Patria hotel

Topics of the conference are related to the implementation of the Directive Nr. 2002/91/EC on the energy performance of buildings, by Act N° 555/2005 and implementary announcement. It targets the prediction of energy needs for heating. Objects will be to asses the thermal protection characteristics of building constructions, hygienic requirements and requirements for air change. Theoretical problems and specifications of the input data will be especially considered for the winter and summer periods in connection with calculated and operational evaluation in the process of energy certification of buildings. The conference will also target the examples of new buildings and major renovated buildings especially on the level of law-energy buildings.

The conference will be addressed not only to scientists, research workers, academicians but also to the general public of project engineers and building constructors, energy control workers, of project engineers and building constructors, energy control workers, participants of new building process and refurbishment of existing dwelling houses and non-dwelling buildings.

Conference main topics

- Legal and technical regulations related to energy performance of buildings
- Thermal protection of structures and buildings – winter season
- Thermal protection of structures and buildings – summer season
- Calculated and operational rating, energy certification of buildings
- Structures and buildings in the level of low energy and passive houses

More information: www.________

Ventilation 2009

the 9th International
Conference on Industrial Ventilation
Clean Industrial Air Technology
Systems for Improved Products and Healthy Environments
18-21 October 2009
Switzerland, ETH Zurich

The tasks and aims of industrial ventilation are to guarantee high product quality, to protect human health, and to prevent environmental pollution. These must be achieved in an energy-efficient way with minimal environmental impact and greenhouse gas emissions.
Papers are invited for the following topics:

- industrial working place, emission and exposure control, target values, and energy efficiency,
- clean room environments,
- exhaust gas treatment,
- Indoor/outdoor environmental air quality related to industrial production,
- occupational health, standards, and policies,
- innovative sensors for ventilation applications,
- specialised ventilation technologies (data centers, mining, tunneling, commercial kitchens, ships, hospital OP)

More information:
www.___________

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Information on AIVC supported conferences and events

ROOMVENT Conference,
Busan, 24-27 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.________

EERB-BEPH Conference,
Guilin, 27-29 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.________

IBPSA Conference and Exhibition,
Glasgow, 27-30 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.________

International workshop on compliance and control on regulations,
Brussels, 1-2 September 2009
The main purpose of this workshop is to present and discuss the evolutions in the national regulations with specific attention to compliance and control issues.

This workshop is organised in close collaboration with the European EIE-ASIEPI project.
It is expected that this workshop will result in a better understanding of the various approaches for compliance and control, as well as opportunities for improvements.

More information: erika.malu@bbri.be

30th AIVC conference and BUILDAIR,
Berlin, 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 Read more on page 9

Ventilation 2009,
Zurich, 18-21 October 2009
The 9th International Conference on Industrial Ventilation Clean Industrial Air Technology Systems for Improved Products and Healthy Environments

More information: www._______