AIR INFORMATION REVIEW

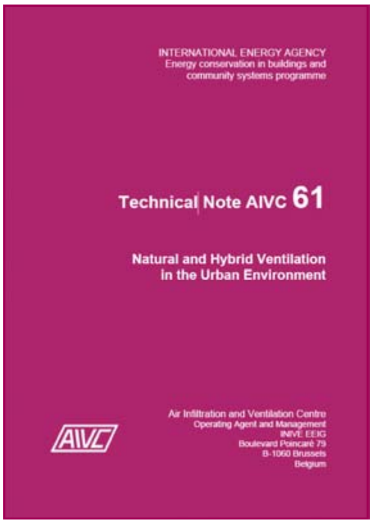
VOL 29, No. 2, March 2008 A quarterly newsletter from Air Infiltration and Ventilation Centre

Five new AIVC publications available!

TN 61 - Natural and Hybrid Ventilation in the Urban Environment
TN 62 - Energy and Indoor Environmental Quality of Low Income Households
VIP 13 - Ceiling Fans
VIP 14 - European Ventilation Standards supporting the EPBD
AIVC Conference Report 2007

Natural and Hybrid Ventilation in the Urban Environment

AIVC Technical Note 61, 2007, 72 pp, Code TN 61
K. Niachou, M. Santamouris and C. Georgakis



Because of specific urban characteristics, the potential of natural ventilation can be seriously decreased in the urban environment due to reduced wind speeds, high ambient temperatures and increased external pollutant and noise levels. Moreover, the performance of hybrid ventilation systems is also affected and they are expected to work most times with mechanical ventilation.

This AIVC Technical Note has been performed in the frame of EU RESHYVENT and URBVENT projects and its main purpose is to highlight the most important constraints and limitations of the urban environment on natural and hybrid ventilation. The report mainly focuses on measurements and prediction of natural and hybrid ventilation in the urban environment, mainly as a result of reduced driving forces and the consequences for indoor air quality and fan assistance, while the consequences of external noise and pollutants are treated sporadically.

A state-of-the-art of natural and hybrid ventilation studies has been performed for urban buildings.

Then, detailed information is given concerning the experimental research and computational procedures carried out within RESHYVENT and URBVENT projects in order to investigate the performance of natural and hybrid ventilation systems in urban buildings. The experimental results refer to typical urban canyon configurations with H/W>1.0 for the climatic conditions of Athens.

Furthermore, more general conclusions are discussed through a number of simulations in order to investigate the effect of different urban canyons on the performance of natural and hybrid ventilation systems in different European climates. Finally, a number of recommendations or guidelines are proposed for the use of natural and hybrid ventilation systems in the urban environment.

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Energy and Indoor Environmental Quality of Low Income Households

AIVC Technical Note 62, 2007, 27 pp, Code TN 62
M. Santamouris

Low income households in developed and less developed countries suffer from serious indoor environmental problems like heat stress, lack of comfort and poor indoor air quality. This has a very serious impact on the quality of life and health of poor citizens. More than 2 million deaths per year are attributable to indoor air pollution from inadequate use of fuels, while thousands of low income citizens die because of high indoor temperatures.

Energy consumption is an indicator of the quality of life. Energy is linked with all aspects of development and has a tremendous impact on the wellbeing of citizens, with respect to health, education, productivity, economic opportunities, etc. The current situation on energy supply and consumption is characterised by wide disparities between the developed and developing world.

This report aims to examine the impact of the energy use, or non use, on the indoor environmental conditions in households occupied by low income people. Also, to investigate the specific physiological and air quality problems caused by the lack or the non appropriate use of energy, and to identify ways that proper ventilation techniques can assist vulnerable and poor people to improve their indoor conditions and decrease associated environmental stress.

Download the new Technote

Ceiling Fans

AIVC VIP 13, 2007, 6 pp
M. Santamouris

Ceiling fans are one of the more credible techniques to decrease energy consumption for air conditioning and improving comfort. Historically, ceiling fans first emerged in hot humid climates and have become more and more popular in certain parts of the world from the early decades of the last century.

Ceiling fans when in use can extend the summer comfort zone, i.e. improving the thermal comfort at higher temperatures (e.g. up to 29 °C). As such, they can have several substantial advantages:

1. In non-air conditioned buildings, ceiling fans can substantially extend the periods of acceptable thermal comfort conditions resulting in better thermal comfort and improved productivity.
2. In air conditioned buildings, they can reduce the use of air conditioning (in hours of operation and in energy use) by setting the room thermostat at a higher temperature.
3. Ceiling fans can avoid the need of installing active cooling systems

Ceiling fans can also improve the energy efficiency during the heating season by reducing vertical stratification: the warm air in the top of the rooms is then driven to the bottom parts of the room. This typically requires the changing of the sense of rotation of the blades.

Studies, mainly performed in the USA, have shown that there are in air conditioned buildings important energy gains associated with the use of ceiling fans. However, monitoring of a high number of buildings has shown that energy gains are only possible if associated with an increase of the set point temperature.

The new Ventilation Information Paper aims to present the main advantages of ceiling fans, the existing knowledge on the impact of ceiling fans on comfort as well as knowledge on the expected energy gains. Some recommendations on the proper use of the fans are also given.

Download the new VIP

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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INIVE EEIG - Lozenberg 7 - BE-1932 Sint-Stevens-Woluwe - Belgium
Tel: +32.2.655.77.11 - Fax: +32.2.653.07.29 - *inive@bbri.be - www.inive.org*

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

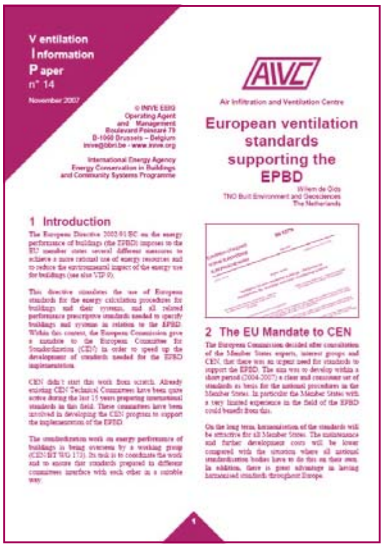
European ventilation standards supporting the EPBD

AIVC VIP 14, 2007, 4 pp
W. de Gids

The European Directive 2002/91/EC on the energy performance of buildings (the EPBD) imposed on EU member states several different measures to achieve a more rational use of energy resources and to reduce the environmental impact of the energy use for buildings (see also VIP 9).

This directive stimulates the use of European standards for the energy calculation procedures for buildings and their systems, and all related performance prescriptive standards needed to specify buildings and systems in relation to the EPBD.
Within this context, the European Commission gave a mandate to the European Committee for Standardization (CEN) in order to speed up the development of standards needed for the EPBD implementation.

CEN did not start this work from scratch. Existing CEN Technical Committees have been quite active during the last 15 years preparing international standards. These committees have been involved in developing the CEN program to support the implementation of the EPBD.



The standardization work on energy performance of buildings is being overseen by a working group (CEN/BT WG 173). Its task is to coordinate the work and to ensure that standards prepared in different committees interface with each other in a suitable way.

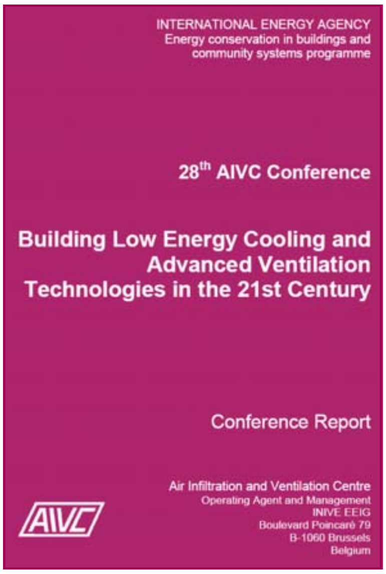
AIVC Online *Download the new VIP*

28th AIVC Conference Building Low Energy Cooling and Advanced Ventilation Technologies in the 21st Century

AIVC Conference Report, 2007, 12 pp

From 27-29 September, the 28th AIVC Conference was held at the Aldemar Knossos Royal Village Conference Centre located in the outskirts of Hersonissos village in Crete, Greece. An excellent ambiance to inspire the ventilation research society.

The 28th AIVC conference was organized in conjunction with the 2nd Palenc conference. Palenc stands for Passive and Low Energy Cooling. So the main theme of the conference was Ventilation and Cooling.



This overview set its focus mainly on the ventilation aspects.

The foreword in the proceedings from P. Wouters and M. Santamouris starts with: "Increase of the living standards, deterioration of the thermal conditions in the urban environment and non-appropriate architectural design have caused a huge penetration of air conditioning in Europe, mainly but not only in the Southern Countries. Such a trend has a very serious impact on the peak electricity demand of these countries and the corresponding energy consumption. Intensive research carried out during the last years has permitted to develop new concepts, technologies and components that permit to decrease drastically or even eliminate the cooling demand of buildings.

In parallel, very low energy consumption for cooling new generation buildings have been realized and monitored.

Intelligent ventilation permit to decrease the cooling demand, improve the comfort conditions and decrease indoor pollution levels. A wide range of activities by the research community and industry has permitted to develop advanced ventilation systems that highly satisfies the above requirements."

This present situation in the world is really a challenge for the researchers to show the possibilities of alternative cooling and ventilation strategies.

There were plenary sessions consisting of Key Note lectures as well as sessions with 3 parallel tracks.
The overview of the normal or standard sessions who all started also with a keynote speaker are done per session but per headline of topic. Going through all the session the choice was on four topics:
- Measurements
- CFD Modelling
- Schools
- Miscellaneous

AIVC Online Download the conference paper

Achieving airtightness

The aim of this three-part Good Building Guide from BRE (United Kingdom) which was published in 2006 is to give the best advice on achieving airtightness in new buildings. It is based on data obtained from laboratory testing and observations made while undertaking air leakage audits in buildings.

The first part (8 pages) describes the common air leakage paths and sets out the principles to follow when developing energy efficient construction details.
Part 2 provides practical guidance on techniques for achieving airtightness in floors, walls, roofs (part 2 - 8 pages). Part 3 concerns airtightness in windows and doors as well as sealing methods and materials.

This guide is available at
www________________

A quantification of the lung dose under specific indoor and outdoor conditions

C. Mitsakou, NKUA, Greece

Exposure to aerosols and the consequent effects on human health have been the topics of special interest in the last years as an increasing number of studies link airborne particulate matter (PM) to mortality rates. Aerosols enter the human body mainly through inhalation. Many modelling works deal with the calculation of respiratory deposition. In respiratory deposition modelling one may distinguish between two broad categories of models, namely, empirical and mechanistic models. The empirical models consider the human RT as a series of anatomical compartments acting as filters for the inhaled particles. The respiratory deposition is seen as a stationary filtering process and the expressions describing the filtering efficiencies derive from, and therefore fit on, experimental data.

Therefore, the application range of such models is strictly limited to the specific morphology, physiology and lung conditions for which the model parameters were adjusted. On the other hand, mechanistic models calculate respiratory deposition on the basis of a more realistic description of lung structure and physiology, and as a result of physical processes. Mechanistic models can be classified in a number of ways. One may distinguish between Eulerian and Lagrangian models, depending on the frame considered in calculating the aerosol flow (stationary or moving with the flow, respectively).

The Lagrangian approach is generally more convenient for tracking aerosol dynamics (hygroscopic growth) in an aerosol flow. However, a Lagrangian scheme has serious limitations in describing the change in form of the aerosol bolus due to axial dispersion, or in describing time-varying flow rates and aerosol concentrations. These difficulties can be dealt with by employing an Eulerian approach.

In the present study we present a numerical model based on the Eulerian approach, describing the air flow and aerosol dynamical processes (hygroscopic growth, coagulation) in the respiratory tract.

The model predicts the temporal variation of the number concentration and the regional deposition of the inhaled particles during a breathing cycle. The applications of the model presented here are: A) the calculation of the lung dose for an individual inside a residential apartment during a common indoor activity (cooking) and B) the comparison of the lung doses for the citizens living in distant European cities with different characteristics (climate, aerosol sources). For the above purposes, inhalation dosimetry calculations in terms of particle number are performed using experimentally determined indoor and outdoor number distributions.

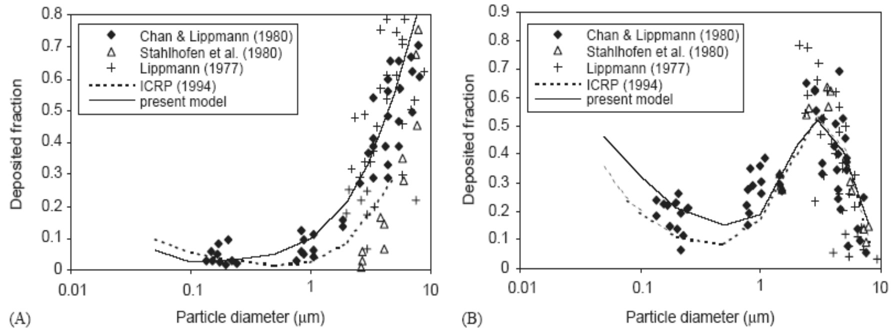
Model description and validation

The aerosol general dynamic equation (GDE), considered in a 1-D form along the flow direction, describes the different processes (convection, axial diffusion, deposition, condensational growth, coagulation) acting simultaneously on the inhaled particulate matter. The size distribution is described with a sectional method, which allows for arbitrary forms of the size distribution. The particle deposition is mainly caused by gravitational settling, Brownian diffusion and inertial impaction. The description of the above deposition mechanisms is based on standard theory for the respective aerosol processes, avoiding the use of empirical correlations.

The numerical difficulties and inaccuracies arising from the solution of GDE are coped with the operator splitting technique (time-step splitting and subcycling) and the use of two grids (stationary, moving) for the sectional description of the particle size distribution.

The respiratory tract consists of the extrathoracic and the thoracic (lung) regions. The thoracic region of the respiratory tract is described with the help of the classical morphometric model "A" by Weibel. According to Weibel's model the thoracic region of the respiratory tract has the form of an airway tree, where the airways branch dichotomously from generation 0 (trachea) to generation 23 (alveolar ducts).

Generations 0–7 make up the bronchial region (BB), 8-15 the bronchiolar region (bb) and generations 16–23 the alveolar or acinar region (AI) of the lung. The region consisting of generations 0-15 is also referred as tracheobronchial region. The volume of the alveolated section of the lung is let to vary with time to accommodate effects due to breathing dynamics. The air velocity along the airways of the respiratory tract is determined by solving the equation of continuity.



Deposited fraction of the amount entering the trachea as a function of particle diameter as experimentally determined and calculated in the tracheobronchial (A) and alveolar (B) region

	Number				Surface (m^2)			
	BB	bb	AI	Total	BB	bb	AI	Total
Scenario 1								
Indoors	7.1E8	4.0E9	3.1E10	3.6E10	1.9E-4	3.7E-4	2.4E-3	3.0E-3
Outdoors	3.9E7	4.3E8	2.9E9	3.3E9	1.1E-6	5.4E-6	4.7E-5	5.3E-5
Scenario 2								
Indoors	9.8E7	1.1E9	5.7E9	6.9E9	4.9E-6	4.7E-5	2.6E-4	3.1E-4
Outdoors	7.1E7	6.9E9	5.5E10	6.3E10	2.5E-5	1.2E-4	1.1E-3	1.2E-3

Number and surface area of deposited particles in the lung regions for scenario 1: 15-min cooking, scenario 2: 8-h sleeping indoors and for the same time intervals outdoors

The model was validated by comparing extensively with the available experimental results in the literature and the predictions of the empirical model used by the International Commission on Radiological Protection (ICRP), as presented in the figure below. More details on model description and validation are given in Mitsakou et al. (2005).

Lung dose inside a residence
Indoor aerosol concentration is often higher than outdoor aerosol concentration and may potentially induce significant health effects, considering that people usually spend as much as 80–90% of their life indoors. The analysis is made for two specific exposure conditions inside a household, namely, during a cooking event and an inactive night period. The size resolved aerosol number concentration was obtained during measurements at a typical occupied residence in Athens (Eleftheriadis et al., 2003).

The following table shows the dosimetry results obtained indoors and outdoors for two scenarios of human activity, using the relevant measured size distributions.

In scenario 1, the subject is assumed to be cooking (frying meat and eggs using gas) for a quarter of an hour and in scenario 2, the subject sleeps for 8 h, while no indoor activity occurs. The results refer to the deposited number and particle surface area, as such results are of current interest in biological and toxicological assessments. The results indicate that a quarter of an hour of cooking results in an equal or even greater particle deposition than 8 hours sleeping, in all regions of the respiratory tract. It must be noted, though, that the actual lung dose from cooking is even greater than the one calculated here, as we have not taken into account the time period after cooking, when part of the produced aerosol is still present.

In scenario 1, the total number of the deposited particles is one order of magnitude higher indoors than outdoors. In scenario 2, the dose for outdoor exposure is one order of magnitude greater in the alveolar region.

However, by comparing the surface area of the deposited particles with the respective surface of the lung regions (BB = 2.9E-2 m^2, bb = 0.24 m^2, AI = 147.5 m^2) we observe that ultrafine particles occupy in all cases a very small fraction of the lung surface areas.

Internal dose for European citizens
Particle number distribution measurements for the cities of Helsinki (Finland), Leipzig (Germany), Athens – centre and suburb – (Greece) were obtained from published works on the urban background of these cities (Eleftheriadis et al., 2003; Shimmo et al., 2003; Tuch et al., 2003). For the present calculations we assumed inert aerosols (aerosol dynamic phenomena – hygroscopic growth, coagulation – are neglected). The estimated deposited fraction and the number of deposited particles per breath for the three regions of the human respiratory tract (ET – extrathoracic, TB – tracheobronchial, AI – alveolar) are given in Tables 2 and 3. Similar alveolar deposition was calculated for all cities. However, the total deposited fraction is lower in Athens centre comparing to Helsinki and Leipzig. On the other hand, the number of deposited particles is greater for the dwellers in Athens centre, as the aerosol concentration levels there are higher. In the suburban area of Athens the deposited fraction per number is lower, since the aerosol there is aged (larger particles) than in Athens centre.

In general, the size increase of small particles leads to the decrease of particle deposition – the mechanism of Brownian diffusion (main deposition mechanism for fine particles) becomes less significant.

	Athens-centre	Athens-suburb	Helsinki	Leipzig
ET	0.06	0.04	0.13	0.12
TB	0.11	0.07	0.19	0.18
AI	0.56	0.46	0.53	0.54
Total	0.73	0.57	0.85	0.85

Deposited fraction per breathing cycle for the citizens of Athens (centre, suburb), Helsinki, Leipzig

	Athens-centre	Athens-suburb	Helsinki	Leipzig
ET	1.62	0.26	2.25	2.25
TB	2.89	0.48	3.06	3.54
AI	14.70	3.06	11.00	10.40
Total	19.20	3.80	16.30	16.20

Number of deposited particles ($x10^6$) per breathing cycle for the citizens of Athens (centre, suburb), Helsinki, Leipzig

References
Eleftheriadis, K., Halios, C.H. and Petrakis, M. (2003) Evaluation of indoor/outdoor aerosol and trace gas concentrations measured in the urban environment, J. Aerosol Sci., 34, S1361–S1362.

Mitsakou, C., Helmis, C., Housiadas, C. (2005) Eulerian modelling of lung deposition with sectional representation of aerosol dynamics, J. Aerosol Sci., 36, 75-94.

Shimmo, M., Saamio, K., Aalto, P., Hartonen, K., Hyotylainen, T., Kulmala, M., Riekkola, M. L. (2003) Particle size distribution and gas-particle partition of polycyclic aromatic hydrocarbons in Helsinki urban area, J. Atmos. Chem., 47, 223-241.

Tuch, T., Wehner, B., Pitz, M., Cyrys, J., Heinrich, J., Kreyling, W. G., Wichmann, H. E., Wiedensohler, A. (2003) Long-term measurements of size-segregated ambient aerosol in two German cities located 100 km apart, Atmos. Environ., 37, 4687-4700.

Air filtration techniques and their applications

A. Ginestet, CETIAT, France

This article is the English translation of a paper published in French in a recent issue of CETIAT newsletter.

Air filtration consists of removing impurities (particles and gases) contained in the air. Regarding the purification of industrial fumes, which uses high temperature chemical treatments, one can distinguish between particulate filtration (removal of particles) and molecular filtration (removal of pollutant gases or molecules).

Particulate matter filtration

One technique available for particulate filtration in order to capture or stop particles consists in using a filtering medium: air and particles go through a fibrous material, woven or not; particles are stopped by mechanical effects (Sieve effect, inertia, interception and diffusion) or electrostatic effects (electrostatic charge of particles and / or fibres). The fibrous medium is usually made of fibreglass or synthetic fibres and particles are captured inside the filter medium (in depth filtration).

Another technique for stopping particles is electrostatic filtration. Air passes through a highly ionised zone in which particles get an electric charge. Air then passes through a set of parallel plates placed under tension towards which particles are attracted because of their charge and the electric field created.

A third technique for particulate filtration is filtration by inertia effects. The air takes a path which forces it to turn and accelerate. The particles are precipitated at the periphery of the flow and captured on appropriate supports. The acceleration of the air can also be done inside high speed rotating elements (cyclone filtration).

The particulate filters are used in many areas: in ventilation of buildings or passenger compartments (cars, planes, farm tractors, …) the protection of components of the air handling systems against dust fooling and to improve indoor air quality; in clean rooms to protect persons (in hospitals), industrial process or goods.

In ventilation systems for domestic and commercial buildings, air filtration mainly uses filtering media, such as for example in air handling units. Some air purifiers also use filtering media.
Electrostatic filtration is not often used in ventilation systems but is currently included in air purifiers.
Filtration by inertial effects is well adapted to liquid particles (aerosols), especially for the treatment of oil mist in industrial workshops.

Molecular filtration

The most common technique for molecular filtration uses an adsorbent material (such as activated carbon) whose internal micro-porous structure allows the molecules to settle by condensation in thin layers (adsorption). For some molecules (VOCs for example), adsorption is a physical phenomenon and is therefore reversible (de-sorption) through heating. For other molecules (sulphur dioxide for example), adsorption is a non-reversible chemical phenomenon. Complex chemical reactions occur inside the adsorbent material, with ozone and nitrogen dioxide for example.

Other techniques for molecular filtration are based on photo-catalysis or cold plasma that produce oxidising chemical species, attacking unwanted molecules. These techniques are sometimes used for indoor air treatment. They do not lead to the capture of the pollutant but their aim is to destroy it. Such destruction may be incomplete and the intermediate chemical products can create adverse reaction if these techniques are not well implemented. These techniques also have some bactericidal properties.

Molecular filtration is not widely used in ventilation systems for buildings but it is found in air handling systems for car compartments or commercial kitchens. Air purifiers use activated carbon as well as photo-catalysis and cold plasma techniques.

What about industrial process?

In industrial applications, fibrous filters are widely used but because of the high concentrations of dust to remove, the medium is used to create a "cake" of dust which is removed at regular intervals by automatic pulsed air jets. The fibrous filters are also used to treat ambient air in workshops (processing of oil mist, fumes, wood dusts, etc.), in air conditioners, for the treatment of air for engines, …

Electrostatic filters are often used, sometimes in combination with fibrous filters, in air purifiers for smoke in workshops and dust removal in industrial process. Molecular filtration is encountered in the industrial sector for the treatment of highly polluted effluents.

Indoor Air Quality in Residential Microenvironments in Athens, Greece

Ch. Halios, NKUA, Greece

In many cases the study of air quality is facilitated with the use of the microenvironment approach, which segregates the ambient air environment to large volumes of air with homogeneous pollutant concentration (Duan, 1981). Each such chunk is considered as a specific microenvironment (ME). A usual separation is among outdoor, indoor home, in transit and workplace (Monn, 2001). Furthermore, it is known that indoor pollution that results from outdoor sources depends upon a number of key parameters and processes, such as the levels of outdoor pollution, transport of pollution between indoors and outdoors, indoor homogeneous chemistry for gases, heterogeneous chemistry between gases and particles on fixed surfaces.

The indoor air quality in residential microenvironments in Athens, Greece was experimentally and theoretically examined in order to study the main mechanisms that control air pollution within the indoor environment.

The experimental results refer to indoor and outdoor measurements of particulate matter (black carbon, PM_{10}, $PM_{2.5}$), photochemical pollutants (O_3, NO_X) and classical pollutants (SO_2) for the microenvironments studied.

The theoretical study was conducted with the aid of an algorithm that was developed in co-operation with the 4M company. The algorithm is based on a well-known indoor air quality model (Multi Chamber Indoor Air Quality Model), a numerical code of 4M and a model for the characterization of indoor air quality from the outdoor environment, the time period and the specific area. The model predictions were compared with experimental data collected from the workplaces and the agreement was found satisfactory.

Initially the study included indoor environments where there were no intense pollution sources and the main mechanisms of penetration and reduction of indoor air pollution were investigated in detail. More specifically, the penetration rate of the pollutants that were produced outdoors and the respective reduction rate indoors were determined. The deposition rates of the pollutants on the indoor surfaces and the source or sink term due to photochemical reactions were also studied. In Figure 1 the mean source and sink rates of the indoor black carbon concentrations due to the various mechanisms at the three residential microenvironments during the cold and warm periods are presented. It can be seen that the variation of the black carbon indoor concentrations depends mainly on the ventilation rates.

The variation of the indoor concentrations of O_3, NO and NO_2 (not shown) due to photochemical reactions depends on the simultaneous indoor levels of these pollutants, while the SO_2 indoor concentrations depends on the ventilation and deposition rates.

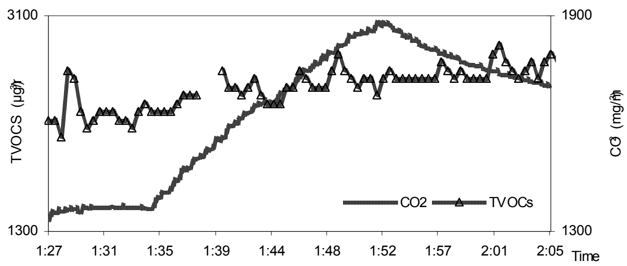
The temporal variation of the above mechanisms in realistic conditions was also studied and the contribution of each mechanism to the total indoor concentration was estimated. It was found that the relative contribution of each of the above-mentioned mechanisms to the indoor concentrations varies within a range of four orders of magnitude.

The air quality in an indoor environment during smoking was investigated in terms of the temporal variation of hazardous pollutants, like nitrogen oxides, ozone and volatile organic compounds, that are released during smoking of a number of cigarettes equal to the average amount during a daytime in a typical flat in the Athens metropolitan area.

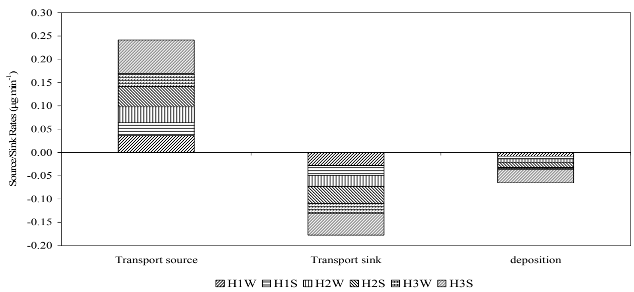
While NO outdoor concentrations did not exceed 5 μgr/m3, indoor NO concentrations increased from 8.6 μgr/m3 to 76.2 μg/m3 (between 14:01 and 14:15 LST), after 4 cigarettes were smoked, and from 5 to 85.7 μgr/m3 (from 16:30 to 16:38 LST) after two more cigarettes.

The same behaviour was observed during night time (00:00 - 05:00 LST) when NO concentrations increased from 3 μg/m3 to 120 μg/m3 after four cigarettes were smoked and then up to 190 μgr/m3 after two more. NO concentrations dropped rapidly, within almost 30 minutes after smoking stopped, which confirms the fact that NO has a short lifetime.
The levels of NO_2 concentrations (not shown) present the same behaviour, while a significant increase of the total volatile organic (TVOCs) concentration was noticed (Figure 2). TVOCs values exceeded the concentration limits of 400 μg m^{-3} set research studies (Molhave et al) very rapidly. The concentration values stayed at very high levels even after smoking stopped and returned to the initial levels after a very long time period. TVOCs concentrations reached values of the order of 1500 μg/m^3 after the volunteers smoked 4 cigarettes and then decreased to 750 μgr/m^3.

After six more cigarettes were smoked, TVOCs concentrations increased again reaching values of the order of 2700 μg/m^3 and they decreased slowly and reached 2570 μg/m^3 within 10 minutes. Similarly, during the time interval 23:00- 8:25 LST, TVOCs increased to 1430 μg/m^3 after 4 cigarettes were smoked and 3100 μg/m^3 after 8 more cigarettes (Fig. 2) in a period of about one hour. After 40 minutes TVOCs concentrations fell to 2400 μg/m^3 and six hours later to 1200 μg/m^3.



Time series plot of indoor concentrations of CO_2 and TVOCs. Information about this work can be found in Halios and Helmis, 2007; Halios et al, 2005; Halios and Helmis, 2005



The mean source and sink rates of the BC indoor concentrations due to the various mechanisms at the three microenvironments during the cold and warm periods

- Duan N. (1981): "Models for human exposure to air pollution", Environ Int, 8, 305-309
- Halios CH and Helmis CG (2005). An indoor air quality study regarding outdoor originating pollutants. IASME Transactions, 4(2), 646-650
- Halios CH and Helmis CG (2007). On the estimation of characteristic indoor air quality parameters using analytical and numerical methods. Science of the Total Environment, 381(1-3), 222-232
- Halios CH, Assimakopoulos VD, Helmis CG and Flocas HA (2005). Investigating cigarette-smoke indoor pollution in a controlled environment. Science of the Total Environment, 337(1-3), 183-190
- Monn C (2001): "Exposure assessment of air pollutants: a review on spatial heterogeneity and indoor/ outdoor/personal exposure to suspended particulate matter, nitrogen dioxide and ozone", Atmos Environ, 35, 1-32
- Molhave L. (1995) 'Evaluations of VOC emissions from materials and products: solid flooring materials', In: Maroni M. editor. Proceedings of Healthy Buildings '95 Conference, September 10-14 1995, Milan, Italy; 1: 145-162.

Air purifiers may generate hazardous ozone

California Environmental Protection Agency
AIR RESOURCES BOARD

California's Legislature established the Air Resources Board (ARB) (www______) in 1967 to:

1. Attain and maintain healthy air quality.
2. Conduct research into the causes of and solutions to air pollution.
3. Systematically attack the serious problem caused by motor vehicles, which are the major causes of air pollution in the State."

The Air Resources Board (ARB) of California Environmental Protection Agency considers that not all air-cleaning devices are appropriate for home use because some of them can be harmful to human health. The ARB also recommends that ozone generators, which are air cleaners that intentionally produce ozone, are not used in the home because ozone can cause health problems, including respiratory tract irritation and breathing difficulty.

This statement from ARB is linked to a California Assembly Bill of September 2006 which directed the Air Resources Board (ARB) to develop and adopt a regulation to limit the ozone emitted from indoor air cleaning devices in order to protect public health. The bill requires the ARB to adopt the regulation by 31 December 2008.

On September 2007, the ARB approved a regulation that limits the ozone emission concentration from indoor air cleaning devices to 0.050 ppm.

The Board voted to allow the manufacturers 24 months after the effective date of the regulation to have their models tested by a Nationally Recognized Testing Laboratory and be certified by ARB.

In the meantime, the website of ARB (www______) provides a list of potentially hazardous ozone generators sold as air purifiers. The website also offers for download interesting technical reports about performance of portable air cleaners (www______).

Improvement of the performance of ventilation systems in existing buildings

In the life of buildings, existing ventilation systems may have to be modified or improved due to their aging or as part of renovation, in order to respond to new needs and requirements.

This new guide in French aims to assist the diagnosis to analyze an existing ventilation system and decide on the necessary changes and improvements.

The decision-making process for different categories of buildings is described by integrating selection criteria (characteristics of the existing ventilation system, constraints, opportunities, requirements), impacts (energy, indoor air quality, thermal comfort and acoustics) as well as costs (design, installation, maintenance).

Examples of solutions are given in the annex for different types of buildings: one-family houses, multi-family buildings, office buildings, schools.

This guide is published by AIR.H (www_______) with the support of ADEME (www_______). AIR.H members are French ventilation systems manufacturers (AERECO, ANJOS, ALDES, France AIR, UNELVENT) together with their association UNICLIMA and their technical centre CETIAT.

air·h
ASSOCIATION INITIATIVE RÉGLEMENTATION HYGIÈNE

The objectives of AIR.H are to promote mechanical ventilation for health and comfort in domestic and commercial buildings, to contribute to the improvement of the quality of the installed systems and to participate to the works linked to the revision of regulations.

The guide can be downloaded for free at www_________.

A new publication by AMCA International about Fan Acoustics

The Air Movement and Control Association International, Inc. (AMCA) has published the English version of one of CETIAT works, «Acoustique des ventilateurs» by Alain Guédel under the title «Fan Acoustics - Noise Generation and Control Methods». CETIAT, a French Industrial Technical Center of HVAC systems manufacturers, has granted AMCA International full publishing rights for the English version.

The English version of this book fulfills a gap in available literature for ventilation engineering as there is a scarcity of published information on the acoustics and noise control associated with fans and their systems.

The Air Movement and Control Association International, Inc. (AMCA) is a non-profit international association of the world's manufacturers of related air system equipment, primarily, but not limited to fans, louvers, dampers, air curtains, airflow measurement stations, acoustic attenuators, and other air system components for the industrial, commercial, and residential markets.

This publication is available for purchase at www________.

Journal of Building Performance Simulation

The International Building Performance Simulation Association (IBPSA - www_______) and Taylor & Francis Journals recently announced the launch of the Journal of Building Performance Simulation (JBPS) - the first issue is going to be published in March.

JBPS is the official journal of IBPSA which is a non-profit international society of computational building performance simulation researchers, developers, practitioners and users, dedicated to improving the design, construction, operation and maintenance of new and existing buildings worldwide.

JBPS is an international refereed journal, publishing only articles of the highest quality that are original, cutting-edge, well-researched and of significance to the international community. The journal also publishes original review papers and researched case studies of international significance. Further information about the journal - including instructions for authors and email contents alerting - is available at www___________.

JBPS provides a forum for original, high-quality papers and review articles dealing with any aspect of building performance modeling and simulation.

The journal aims at being a reference and a powerful tool to all those professionally active and/or interested in the methods and applications of building performance simulation. Submitted papers will be peer reviewed.

Paper submission is solicited on:

- theoretical aspects of building performance modeling and simulation;
- methodology and application of building performance simulation for any stage of design, construction, commissioning, operation or management of buildings and the systems which service them;
- approaches that integrate systems for gathering archival and dynamic data, algorithms that blend simulation models and data, and software infrastructure to support "model execution, data gathering, analysis prediction, and control algorithms."multiscale methods that can deal with large ranges of time and space (from construction details to regional scale) and link various types of physics;
- uncertainty, sensitivity analysis, calibration, and optimization;
- methods and algorithms for performance optimization of building and the systems which service them;
- methods and algorithms for software design, validation, verification and solution methods.

Papers covering applications should be presented in such a way that the separate steps in the process, such as model development, computer implementation of the derived model, mathematical and scalability problems encountered and validation/verification with real data become transparent to all reader.

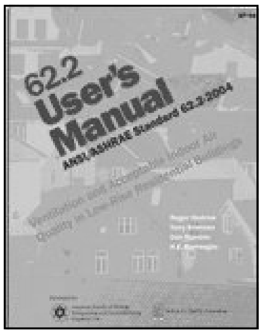
Theory may play an important role in a paper, but it should be presented in the context of its applicability to the work being described. For application-oriented readers it is essential that theoretical papers should cover the following aspects: why the theory is relevant and how it can be applied, what is the novelty of the approach and what are the benefits and objectives of a new theory, method or algorithm; what experience has been obtained in applying the approach and what innovations came about as a result of this?

Special issues on specific topics will be published from time to time.
We invite you to consider this journal for publishing your research results.

A call for papers (insert link to pdf in annex) has been sent out. For full submission details, please see the journal's homepage
www_________ and click
on the "Instructions for Authors" tab.

ASHRAE Publishes User's Manual for Standard 62.1

ATLANTA – A manual to help users navigate the changes in ASHRAE's 2007 ventilation standard is now available.



The Standard 62.1-2007 User's Manual provides users with a better understanding of the design, installation and operation requirements in ANSI/ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality.

The standard, published last year, contains new requirements for separation of environmental tobacco smoke (ETS) spaces from ETS-free spaces, clarification of humidity control design requirements, and the inclusion of new rates for high- rise residential occupancies.

"The manual provides guidance for designers and contractors to clarify the requirements, explains why the requirements are included (in some cases), and how to comply," Roger Hedrick, vice chair of the 62.1 committee, said.

More information at
www_________.

AIVC Conference 2008

Kyoto, Japan, 14-16 October 2008

Advanced building ventilation and environmental technology for addressing climate change issues

From 14 to 16 October 2008, the 29th AIVC Conference will be held at Kyoto International Conference Centre, Kyoto, Japan, where the Kyoto Protocol was negotiated in December 1997. The conference will provide a valuable best opportunity for researchers and engineers worldwide to convene for 'Advanced building ventilation and environmental technology for addressing climate change issues'.

The increase in Carbon Dioxide due to energy use in buildings is a common issue for most countries in the world. Above all, it is expected that the energy use for indoor environmental control including ventilation, heating and air-conditioning must be substantially reduced to mitigate the global warming issue, while there are increasing demand for better indoor health and comfort.

A book of the conference proceedings will be published and will be available to the participants during the conference.

The official language of the conference will be English. Simultaneous translation will be available in some of the sessions.

The deadline for online registration is 24 September 2008, Japan Standard Time (GMT+9).

The organizing committee of AIVC 2008 consists of:
- Hiroyuki Yamanouchi (Chairman, Building Research Institute, Japan)
- Junichi Gouda (Co-Chairman, National Institute for Land and Infrastructure Management, Japan)
- Morad Atif (National Research Council, Canada)
- Yuichiro Kodama (Kobe Design University, Japan)
- Haruki Osawa (BRI, Japan)
- Mat Santamouris (University of Athens, Greece)
- Takao Sawachi (NILIM, Japan)
- Max Sherman (Lawrence Berkeley National Laboratory, USA)
- Peter Wouters (Belgian Building Research Institute, Belgium)
- Hiroshi Yoshino (Tohoku University, Japan)

More information and registration at:
www.aivc2008.jp/info@AIVC2008.jp

Health risk for children

The French Ministry of Environment and Sustainable Development recently published a guide for local communities entitled "Identifying, preventing and reducing environmental health risks in the buildings for children".

This guide allows us to anticipate and to manage health risks in existing or future public buildings for children: children's gardens, elementary schools, colleges, high schools, buildings used for leisure activities or holiday camps, sports buildings. It emphasizes the role of ventilation for indoor air quality.

The guide in French is available for free at
www___________________________.

New newsletter from WHO centre for Housing and Health

The WHO Collaborating Centre for Housing and Health at the State Health Office Baden-Wuerttemberg is publishing a new newsletter.

For receiving this (free of charge) newsletter regularly, one should send an email to the email address _____@_____ with the title saying „Subscription to housing and health newsletter".

Alternatively, you can take out a subscription on the "Service"-button at the right side of their homepage
www_____________________.

An interview with Hugo Hens 30 years of building physics research and 20 years of IEA leadership

AIR: You have been active in this area for more than 35 years with strong international activities and collaboration with industry. What are for you the most remarkable experiences?
Perhaps the fact that energy efficiency as a key issue in building finally permeates the whole construction industry, from designers to contractors, up to principals.

AIR: The area of buildings physics, indoor climate and HVAC has progressed a lot during the last decades. What is the impact on education?
Some 20 years ago, we started with a building engineering education at our university. The aim is to put civil engineers on the market who have a holistic view on whole building technology, from structural over building physics and performance based design up to indoor environment and HVAC.
That holistic view is important as buildings today are very complex entities, where independent decision making in each field is not possible anymore.

AIR: Your involvement in the activities of the International Energy Agency has been a major part of your international collaboration. Leading 4 IEA annexes (IEA Annex 14, 24, 32 and 41) must have been challenging. How do you look back on these experiences?
With happy feelings. International collaboration is not easy. One must always keep a subtle balance between each country's interest and the common objectives. We did it by pushing people to introduce papers with new ideas at each meeting, while keeping sight of common work through common exercises and specific case studies.

AIR: The materials and systems used today are often very different from those used 20…30 years ago. What are for you the most striking examples?
True. On one hand materials came and went. Take reflective foils and transparent insulation as an example. On the other hand, some evolutions were straight forward. High performing concrete did not exist when I started my career. Glazing systems today are much more performant in terms of thermal insulation, sound insulation and solar properties than the systems on the market 25 years ago. Thanks to the usage of collectors and octopus lines piping in hydronic heating and sanitary systems is much simpler than 25 years ago. Boilers, heat exchangers, pumps, fans and heat pumps have upgraded a lot. The use of chilled beams and cooling ceilings have become common practice. Control systems are much more performing, etc.

AIR: Our readers have a specific interest in ventilation related issues. What are the challenges for the various stakeholders (government, industry, consultants, designers)?
Especially in the residential sector, too many designers still believe ventilation is something that is there by definition. The fact that a ventilation system should be designed is something felt as being imposed. Governmental departments should therefore keep stressing the importance. The industry should further upgrade the systems and products they sell while keeping in mind that simplicity in operation is very important in the residential sector.

A home can not be treated as a machine. Experience for example, thaught us that it is very difficult to convince people they should keep windows closed in their new or retrofitted homes with balanced ventilation system and heat recovery. And of course, they may have a reason to sleep with open windows in cool climates. Colder air feels fresher.

AIR: Climate change is today on the first item of many agendas. What is your forecast for the building sector? And what does it mean for the ventilation sector?
Climate change is an overall issue that triggers the whole society. Combating it means rethinking our whole energy system. On the consumption side, the start must be maximum efficiency in terms of much less energy needed for the services delivered. At the production side, perhaps an all electrical society may be the final answer, generated by a combination of nuclear power, hydropower, plants burning renewables, wind turbines and solar. Excess in generation should be used to produce hydrogen, which in turn may replace the fuels used today for transportation. The oil left may then become a base material, with some use as fuel for air transport and shipment.
The ventilation sector falls under the heading efficiency. The service delivered is indoor air quality, the price is the system needed and the energy consumed. Either way, one should develop systems which are more polyvalent than those available today.
Homes may have mechanical ventilation with heat recovery in winter but turn to natural ventilation with some fan support in summer. Also the artificial split between natural and forced ventilation should disappear. Both have advantages and disadvantages.

AIR: Finally, what message would you like to transmit to our AIR readers?
Striving for energy efficiency will remain an important objective, also once fossil fuels reach depletion, not because nothing is left but because prices will skyrocket. In fact, less energy demand means a cheaper energy infrastructure.
However, less should be reached without degradation of the quality of the services delivered. Indoor air quality is one of these services. Of course, IAQ is a complex concept, with lot of questions still unanswered and some questions answered perhaps in a way that is too simple. Take schools. My generation was educated in non-ventilated schools. Research today attempts to prove that this should be negative for the intellectual performances of the children. With that in mind, the results we achieved should be highlighted, as the air quality we had to live with was a disaster: a coal stove in the middle of the class, with smoke coming out from time to time, no open windows because it was too cold in winter (global warming was in its infancy), the odours of some children (showers were a luxury product)… And, so we did not do so badly after all!

AIR: Many thanks for this interview.

"Hugo Hens has completed his engineering studies in 1968 at the Katholieke Universiteit Leuven (KUL). After working for 4 years as a building construction engineer, he became full time researcher at the KUL, Department of Physics, where in 1975, he obtained his Phd. From 1976 to 1981, he was assistant-professor at the KUL, in charge of the lectures in building physics and building construction and he founded the Laboratory of Building Physics in 1978. Since 1981, he is a full professor at the KUL, responsible for the lectures in building physics, applied building physics (performance approach) and building HVAC services and head of the Building Physics Laboratory. His research and consulting activities are mainly dealing with the energy and performance analysis of building elements and of integral buildings. He is internationally renowned as a leading authority in building physics."

CLIMA 2010

Turkey, Antalya
First announcement

The REHVA World Congress Clima 2010 will take place in Antalya/Turkey on 9-12 May 2010 (www____________).
Its theme is “Sustainable Energy Use in Buildings” and the congress will cover all aspects of HVAC technology and focus on the use of sustainable energy in buildings by putting the latest research and technical innovations into practice. Previous congress Clima 2007 in Helsinki attracted close to 1000 participants from over 50 countries.

The Call for papers of the conference will be published in January 2008, and the deadline for abstracts is June, 2009.

September 2008, Coimbra, Portugal International meeting on thermal manikin

Ventilation as part of passive cooling strategies as well as the air flow patterns in rooms can have an important impact on the thermal comfort sensation. The use of thermal manikins can help to better understand the impact of ventilation on thermal comfort.

The Seventh International Thermal Manikin and Modelling Meeting (7I3M) will be held in the University of Coimbra, in Portugal, from the 3-5 of September 2008.

The 7I3M aims to provide an opportunity for international experts to share their research and experience with thermal manikins and thermal modelling. Topics will include thermal manikins, standards, applications, thermal comfort and modelling.

All aspects of manikin and modelling including research, development and applications will be considered for this meeting. Abstracts are specifically sought in the following categories:
- Thermal manikin application including aerospace, automotive, clothing, commercial, industrial and military
- Human thermal physiology and mathematical models
- Manikin, modelling and testing standards
- Thermal manikins
- Breathing manikins
- Sweating manikins
- Moving manikins
- Human / indoor environment interaction
- Body parts
- Virtual manikins

Abstracts are required before 31 March 2008 for review and selection. They should have a maximum of 500 words and may include some figures or graphics as long as they do not exceed the size of two A4 pages. You can download the template for abstracts or have more information about the conference in: www__________.

Building Physics Symposium in honour of Prof. Hugo Hens

Leuven, Belgium

The Laboratory of Building Physics of the Katholieke Universiteit of Leuven (KUL), Belgium, is organizing a symposium on recent developments in Building Physics in honour of Prof. H. Hens. The objective of the conference is to provide researchers and PhD students a forum to share and discuss the most recent and significant developments in building physics.

H. Hens completed his engineering studies in 1968 at the KUL. After working for 4 years as a building construction engineer, he became a full time researcher at the KUL, Department of Physics. In 1975, he obtained his Phd in building physics.

The venue will be held at the Groot Begijnhof in Leuven, a charming medieval city with a young dynamic heart.

Important deadlines:
1 May 2008: abstract submission
15 June 2008: abstract acceptance
15 September 2008: paper submission
1 May - 15 September 2008: registration

From 1976 to 1981, he was assistant-professor at the KUL, in charge of the lectures in building physics and building construction and he founded the Laboratory of Building Physics in 1978. Since 1981, he is a full professor at the KUL, responsible for the lectures in building physics, applied building physics (performance approach) and building HVAC services and head of the Laboratory of Building Physics. His research and consulting activities are mainly dealing with the energy and performance analysis of building elements and of integral buildings. He is internationally renowned as a leading authority in building physics.

Papers are invited on the following topics:
- Advanced modelling of building physics issues
- Hygrothermal performance - heat, air and moisture transfer in the building envelope
- Energy performance and energy efficiency
- Durability, sustainability and reliability
- Whole building modelling
- Developments in envelope materials and systems
- Interior environment – indoor air quality, acoustics, lighting

Abstracts will be peer-reviewed. Papers and presentations are in English. Format for abstracts and papers is posted on the conference website (*www____________*).

PhD Course on heat and mass transfer

26 May - 13 June 2008
TU Denmark

In the framework of the International Research School ___@____.
In cooperation with ETH Zürich, TU/e and Chalmers University of Technology.

The course is intended for PhD and graduate students and for researchers in Building Physics, Building Engineering, Civil and Environmental Engineering, Material Science, Bio-engineering, Mechanical Engineering and Chemical Engineering. It is offered as an international course for which credits can be obtained.

For information and registration please find contact Anne Rasmussen, ___@_____, secretary at DTU.

General summary on the IAQVEC 2007 conference

F. Allard

IAQVEC 2007

From 28-31 October, the 6th International conference on Indoor Air Quality, Ventilation and Energy Conservation in Buildings, IAQVEC-2007, was held at the Sendai International Centre, in Sendai, Japan, organized by Graduate School of Engineering, Tohoku University, under the Presidency of Professor Hiroshi Yoshino.

First held in Montreal (1992, 1995), Lyon (1998), Changsha (2001), Toronto (2004), this conference was the 6th in a series of international conferences devoted to an integrated approach to design and operate buildings.

394 participants attended the conference representing 32 different countries. 241 oral presentations and about 104 posters have been proposed as well as an exhibition of 54 industrial partners.

8 invited lectures were presented:
- Prof. Shuzo Murakami, Keio University: "*Promotion of Sustainable Buildings based on Paradigm of Eco-efficiency*"
- Prof. Francis Allard, University of La Rochelle: "*Building Energy Conservation: European Countries' Experience*"
- Prof. Richard de Dear, Macquarie University: "*Adaptive Comfort in Australia and impacts on Building Consumption*"
- Prof. Jan Sundell, Technical University of Denmark: "*The Indoor Environment in Homes and Health – What We have learnt, If Any*?"
- Prof. J. David Miller, Carleton University: "*Indoor Air Quality and Occupant Health in the Residential Built Environment: Future Directions*"
- Prof. Qingyan Chen, Purdue University: "*Computational Fluid Dynamics for Indoor Environment Modelling: Past, Present and Future*"
- Prof. Paula Cadima, Technical University of Lisbon: "*An Integrated Building Design Approach*"
- Prof. Jüergen Baumüeller, University of Stuttgart: "*Future Urban Planning Approaches in Response to the Climate Change*".

Concerning the oral presentations, they were well distributed and focusing on the scope of the conference; roughly speaking, 20% were directly linked to energy efficiency in buildings, 20% related to ventilation, 20% on general problems of IAQ and health. Some specific indoor environment issues such as large enclosures, schools, hospitals or cars and trains where also addressed as well as innovative technologies and policies.

13 specific workshop sessions have also been organised:
- IEA/ECBCS Annex 41 Whole Building Heat, Air and Moisture Response
- IEA/ECBCS Annex 44 Integrating Environmentally Responsive Elements in Buildings
- IEA/ECBCS Annex 49 Low Exergy Systems for High Performance Buildings and Communities
- Productivity and Indoor Environment in Offices and Schools
- Mold and Other Risk-Factors for Health
- The European Energy Performance of Buildings Directive
- GHG Mitigation in Building Sector by IPCC Report
- Energy Distribution System in Urban Area
- Integrated Building Design
- Urban Ventilation & Outdoor Environment
- Global Building Energy Consumption Data Benchmarking
- Building Energy in China – the Present and the Future Response
- ISO/TC163 Thermal Performance and Energy Use in the Built Environment

A student forum completed the activities in order to enhance exchanges and discussions between PhD students of the field.

The main issues of the conference could be summarized in 5 classes:
- Concerning IAQ and health in buildings, the limits of our knowledge appear clearly in different aspects. There remains a lot of basic studies to carry out in order to predict and interpret correctly the basic physical and chemical aspects as well as the impact of IAQ on humans.
- There is a growing interest on "other indoor environments" like cars, trains cars, airplanes, schools or hospitals which have specific problems and need specific studies.
- For Energy benchmarking in buildings, we really need to consolidate our efforts in order to reach a common methodology. Long term analyses are necessary as well as socio economical analysis taking into account the social context or the occupant behaviour.
- One of the key issues is also the interaction between the buildings and their close environment. It is necessary to study more deeply these interactions in order to improve the urban conditions (mitigation of heat island effect), reduce the thermal and environmental effect on the urban buildings and improve globally both indoor and outdoor environments.
- Finally the key word which best summarizes most of the ideas developed during the conference is INTEGRATION: integrated design of buildings, systems integration, and integration of environmental quality assessment in a Multicriteria evaluation of the built environment.

Belgium
P. Wouters & Ch. Delmotte
Belgian Building Research Institute
Lozenberg 7
1932 Sint-Stevens-Woluwe - Belgium
Tel: +32.2.655.77.11
Fax: +32.2.653.07.29
aivc@bbri.be
www.bbri.be

Czech Republic
M. Jicha
Technicka 2
61669 Brno - Czech Republic
Tel: +42.541.14.32.71
Fax: +42.541.14.33.65
jicha@fme.vutbr.cz

I. Plockova
Ministry of Industry and Trade
Construction dept.
Na Františku 32
110 00 Praha 1
Czech Republic
Tel: +420.224.85.22.11
Fax: +420.224.85.32.16
plockova@mpo.cz

Denmark
P. Heiselberg
Aalborg University
Indoor Environmental Engineering
Sohngaardsholmsvej 57
DK-9000 Aalborg
Denmark
Tel: +45.9.635.85.41
Fax: +45.9.814.82.43
ph@civil.auc.dk

B. W. Olesen
Technical University of Denmark
Building 402
DK-2800 Lyngby
Denmark
bwo@mek.dtu.dk

France
P. Deroubaix
ADEME
Département Bâtiment et Collectivités
500 Route des Lucioles
Sophia Antipolis
06560 Valbonne - France
Tel: +33.4.93.95.79.56
Fax: +33.4.93.65.31.96
pierre.deroubaix@ademe.fr
www.ademe.fr

Contact for the diffusion of AIR in France:
francois.durier@cetiat.fr

Greece
M. Santamouris
Building Environmental Studies
Applied Physics Section
Department of Physics
University of Athens
University Campus, Building Physics 5
15784 Athens - Greece
Tel: +30.210.727.68.47
Fax: +30.210.729.52.82
msantam@phys.uoa.gr
grbes.phys.uoa.gr

Japan
T. Sawachi
National Institute for Land and Infrastructure Management - NILIM
1 Tachihara Tsukuba
305-0802 Japan
Tel: +81.29.864.43.56
Fax: +81.29.864.67.74
sawachi-t92ta@nilim.go.jp
www.nilim.go.jp/english/eindex.htm

H. Osawa
Building Research Institute
1 Tachihara Tsukuba
305-0802 Japan
Tel: +81.29.864.6667
Fax: +81.29.864.6775
osawa@kenken.go.jp
www.kenken.go.jp/english/index.html

Republic of Korea
Yun-Gyu Lee
Building & Urban Research Department
Korea Institute of Construction Technology - KICT
2311 Daehwa-Dong, Ilsan-Gu, Goyang-Si Gyeonggi-Do, 411-712 Rep. of Korea
Tel: +81.31.91.00.351
Fax: +81.31.91.00.361
yglee@kict.re.kr
www.kict.re.kr

Norway
P. Schild
SINTEF Building Research
Forskningsveien 3b
PO Box 124, Blindern
0314 Oslo - Norway
Tel: +47.22.96.58.54
Fax: +47.22.96.57.25
aivc@sintef.no
www.sintef.no/byggforsk

Netherlands
W. F. de Gids / W. Borsboom
TNO Built Environment and Geosciences
Division of Building and Systems
PO Box 49
2600 AA Delft - Netherlands
Tel: +31.15.26.95.300
Tel direct: +31.15.269.52.80
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wil.degids@bouw.tno.nl
www.bouw.tno.nl

USA
M. Sherman
Lawrence Berkeley
National Laboratory
1 Cyclotron Rd
MS 90-3074
Berkeley, California
CA 94720
United States of America
Tel: +1.510.486.40.22
Fax: +1.510.486.66.58
mhsherman@lbl.gov
www.lbl.gov

Operating Agent
INIVE eeig
P. Wouters & Ch. Delmotte
Lozenberg 7
1932 Sint-Stevens-Woluwe - Belgium
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Item **	Qty	Unit Price*		Total
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AIVC publications CD-Rom - Edition 2007 (1 CD-Rom)		100,00 EUR	121,00 EUR	
Air Information Review & personal access code to AIVC publications online (Subscription 2007) (Free for Belgium, France, Greece, Norway, The Netherlands, USA) Temporary special offer		100,00 EUR 50,00 EUR	121,00 EUR 60,50 EUR	
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Proceedings of AIVC conferences 1998 - 2004 (1 CD-Rom)		150,00 EUR	181,50 EUR	
AIVC publications CD-Rom - Edition 2007 (1 CD-Rom)		200,00 EUR	242,00 EUR	
Air Information Review & personal access code to AIVC publications online (Subscription 2007) (Free for Germany) Temporary special offer		200,00 EUR 100,00 EUR	242,00 EUR 121,00 EUR	
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* 21% VAT applies to non VAT-registered customers in the European Union (EU). VAT-registered customers in the European Union (EU) should include their VAT registration number with their order and will be invoiced without VAT. Customers outside the European Union will be invoiced without VAT.
** CD-Roms have been developed for use in a Microsoft Windows environment for PC
Conditions of sale are available at www.aivc.org

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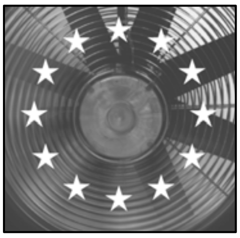
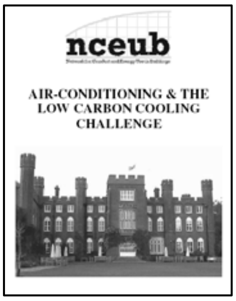
Information on AIVC supported conferences and events



Blower-Door-Symposium, Kassel, May 2008

The 3rd European **Blower-Door-Symposium** is held in Kassel (Germany) on 30-31 May 2008. The symposium will focus on air-tightness, ventilation and mould. Topics include e.g.: Airtightness examination methods, Airtightness in the building process: planning, design, construction; Airtightness concepts and durable links in new and existing buildings; Effects of unsufficiant airtightness; Airtightness and economy; Mechanical ventilation in residential buildings; mould - causes and prevention; Training and education, qualification, and quality assurance; Current standards and directives, technical regulations, legal aspects.

More information: www______________



Windsor Thermal Comfort Conference, Windsor, July 2008

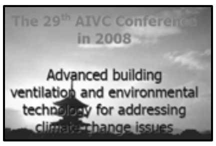
This is the 5th Windsor thermal comfort conference and held in Windsor (UK) from 27-29 July 2008. The kind of questions addressed by this conference include:
- When is AC essential?
- Are there ways to make it more efficient?
- What conditions should it provide?
- Can controls improve energy efficiency?
- What will be the effect of climate change and rising energy prices?
- How can thermal comfort standards reflect concerns for sustainable buildings?
- What are the cultural consequences of reliance on AC?
- How can we achieve Low Carbon Cooling?

More information: www______________

Indoor Air Conference, Copenhagen, August 2008

The 11th International **Indoor Air Conference** on Indoor Air Quality and Climate will be held in Copenhagen (Denmark) 17-22 August 2008. It is a multidisciplinary event involving participants from medicine, engineering, architecture and related fields. The congress covers all aspects of Indoor Air and Climate and the effects on human health, comfort and productivity. Cutting-edge research results will be presented, including ways to achieve an optimal indoor environment in a sustainable manner. The congress addresses a variety of indoor environments – residential, office, school, industrial, commercial and transport.

More information: www_________________



29th AIVC conference, Kyoto, October 2008

The **29th AIVC conference** will be held in Kyoto (Japan) 14-16 October 2008.
The conference will cover a wide range of ventilation related topics whereby specific attention will be given to building ventilation and environmental technologies addressing climate change issues.

More information: www.aivc2008.jp

Building Physics Symposium, Leuven, October 2008

The Laboratory of Building Physics of the Katholieke Universiteit of Leuven, Belgium, is organizing the Building Physics Symposium on recent developments in Building Physics in honour of Professor Hugo Hens. The objective of the conference is to provide researchers and PhD students a forum to share and discuss the most recent and significant developments in building physics.
More information: www___________________