AIR INFORMATION REVIEW

Vol 23, No. 2, March 2002 A quarterly newsletter from the IEA Air Infiltration and Ventilation Centre

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Editorial

More than 8000 copies of the September and December issue of AIR and the AIVC CD have been printed and distributed. We are pleased with the positive reactions, which are giving us the encouragement to go further in this direction.

It is a pleasure to announce to you that the Fraunhofer Institute for Building Physics has joined INIVE EEIG. This will now enable us to distribute AIR and the AIVC CD on a large scale in Germany. Moreover, the wide experience of our new partner will contribute to the availability of more information for our readers. More information about the Fraunhofer Institutes in general and about the Fraunhofer Institute for Building Physics in particular can be found on the AIVC CD or on the Internet (*www.ibp.fhg.de*). Interested organisations or persons in Germany who would like to receive AIR and the AIVC CD can ask for information from the Fraunhofer Institute *hk@ibp.fhg.de*

There is also news from the research field. The European research project RESHYVENT started officially in January 2002. It brings together more than 20 organisations throughout Europe, including manufacturers, consulting firms and researchers. Whereas the IEA ECBCS project Annex 35 - HYBVENT focuses on hybrid ventilation in non-residential buildings, this project concentrates on its application in dwellings. For more information, see page 3 and the AIVC-CD. It is expected that both projects will result in a much better understanding of the potential of and the challenges for hybrid ventilation systems and, at least as important, in commercially available systems.

A new European Directive on the Energy Performance of Buildings is in full preparation and a lot of discussions are going on, both at the levels of the Council and the European Parliament. There is a reasonable chance that this directive will be adopted within the coming year. This will result in a legal framework imposing each EU member state to adopt an energy performance regulation and other energy efficiency measures in buildings. As is further explained on page 4 of this newsletter, ventilation and indoor air quality receive particular interest.

The preparation of the 23rd AIVC conference combined with the 3rd EPIC conference (Lyon, 23-26 October 2002) is progressing well. More than 200 abstracts have been submitted. Also the preparation of the workshops is going well. Therefore, we believe that all the ingredients are available for an attractive conference programme. Since the launch of the 6th European Framework Programme has been announced for the beginning of November 2002, this conference is a unique opportunity to make new contacts. More information about the conference can be found on pages 8 and 9 of AIR.

If you have interesting contributions for AIR and/or the AIVC-CD, don't hesitate to contact us (*aivc@bbri.be*). Finally, don't forget to visit our website *www.aivc.org* .

We wish you a pleasant read.

Peter Wouters
Operating Agent AIVC
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AIR
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 and CD is to encourage and increase information exchange among ventilation researchers and practitioners worldwide.

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Contributions to AIR: Suggestions for contributions are welcomed.

Subscriptions
(See also the subscription form on page 15 or on the CD)

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1) AIVC Member Countries with INIVE Member: Belgium, France, Germany, Greece, Norway
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4) A free version of AIR without any links is available at *www.aivc.org*

Discounts are given for multiple subscriptions - see page 15.

GUIDE TO THE NEWSLETTER

Throughout the newsletter you will see *websites* and *email contacts*. A jump to the AIVC CD is shown with . Simply click to jump to the CD, to your chosen website, or to send an email. For an overview of the contents of the CD click here .

WEBSITE INFORMATION

Comprehensive Information about Indoor Air Quality

A part of the United States Environmental Protection Agency (EPA) web site is dedicated to Indoor Air Quality issues .

It contains very comprehensive information on topics such as indoor air quality in schools, homes, offices and large buildings, moulds and mould spores, secondhand smoke, asthma, radon, etc.

The Publications page gives free access to many online guides and documents about Indoor Air Quality.

The web site also allows the viewer to preview and download the free I-BEAM (Indoor Air Quality Buildings Education and Assessment Model) software. It contains text, animation/visual and interactive/ calculation components, and is designed to be a state-of-the-art guidance for managing IAQ in commercial buildings.

INFO FROM PROJECTS

A Note on EUROVEN

The European Multidisciplinary Scientific Network on Indoor Environment and Health concerning associations between ventilation and health, EUROVEN, was established in the year 2000 to create a multidisciplinary forum for the adequate communication of scientific results between different disciplines. Nine scientists: Wolfgang Bischof, Geoffrey Brundrett, P. Ole Fanger, Finn Gyntelberg, Sten Olaf Hanssen, Paul Harrison, Anthony Pickering, Olli Seppänen and Peter Wouters, from medicine, epidemiology, toxicology and engineering, review the peer-reviewed scientific literature concerning ventilation and health in nonindustrial indoor environments. The group is led by Jan Sundell and the European Commission has supported its work.

In the year 2000, the group reviewed 105 papers published in peer-reviewed scientific journals on the effects of ventilation on health, comfort and productivity in non-industrial indoor environments (offices, schools, homes, etc.). The group deemed only 30 papers conclusive, i.e. providing sufficient information on ventilation, health effects, data processing and reporting. The scientific literature was gathered by searching through databases and covering all papers published in scientific journals from 1966 to 2000 (2 earlier papers from 1936 and 1955 were also included). A consensus was reached that ventilation is strongly associated with comfort (perceived air quality) and health (sick building syndrome (SBS) symptoms, inflammation, infections, asthma, allergy, and short-term sick leave), and that an association between ventilation and productivity (performance of office work) is indicated. The group concluded that increasing outdoor air supply rates in non-industrial environments improves perceived air quality; that outdoor air supply rates below 25 L/s per person increase the risk of SBS symptoms, increase short-term sick leave and decrease productivity among occupants of office buildings; and that ventilation rates above 0.5 air changes per hour (h^{-1}) in homes reduce infestations of house dust mites in Nordic countries. According to the group, the literature indicates furthermore that in buildings with air-conditioning systems there may be an increased risk of SBS symptoms compared to naturally or mechanically ventilated buildings, and that improper maintenance, design and functioning of air-conditioning systems contributes to an increased prevalence of SBS symptoms.

The work of EUROVEN continued in 2001. The group reviewed the scientific literature on the role of ventilation in non-industrial indoor environments. This work will be published later in 2002.

Further information on EUROVEN can be obtained from Pawel Wargocki, who is the scientific

secretary of the EUROVEN group, or in the forthcoming paper in Volume 12, 2002 of Indoor Air journal.

Building Envelopes are Part of a Whole: Reconsidering Traditional Approaches

Leo Hendriks,

Although nobody will disagree on the statement in the title of this article, everyday practice reveals many difficulties in actually working when keeping in mind this awareness. Almost any process concerning building demand and supply in practice can be characterised as an arena where many different interests and stakeholders exist. Therefore applying available knowledge in an appropriate way, and moreover, with an appropriate level of aggregation, is perhaps the real challenge. This refers to striving for optimal quality from many different points of

view and considering many different perspectives. Every knowledge domain concerning the built environment has to be involved, including architects, building engineering, economists and so on. Also it includes the management of these complex processes, as well as customer-oriented deliberations. The first user (mostly referred to as a customer) in this quality-based approach is important, but also more general topics have to be taken into consideration.

The awareness that a more holistic approach of the built environment delivers context is gaining ground. IEA's (International Energy Agency) Annex 32, and its main publication explored this field and delivered a conceptual as well as an operational approach for better communication and understanding. For the knowledge domain of building physics a complete frame of reference is delivered and practical applicability is not forgotten. The results of this Annex must not only be regarded as philosophical or conceptual. When applying the results of this Annex conditions are optimal for added value because of better insights in processes on different aggregation levels (building stock and building). Stakeholders can use it as guidelines for better communication and understanding. On product levels this may lead to more awareness of different interests and roles of stakeholders, with as a result: better integral quality. Also research and development in various areas can benefit from this approach.

The complete article is included on the CD-ROM that comes with this issue of AIR.

International Projects on Hybrid Ventilation in Dwellings, Offices and Schools

As far as innovative ventilation is concerned, the division between natural and mechanical ventilation is becoming rather weak in many cases. More fundamentally, one observes that there is a tendency to combine the best of both technologies: intelligent natural ventilation if appropriate, efficient mechanical ventilation if required. This tendency is valid also for ventilation in relation to thermal comfort in the summer.

This new tendency is called hybrid ventilation. Hybrid ventilation systems can be defined as :

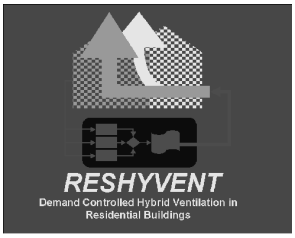
"Hybrid ventilation systems can be described as systems providing a comfortable internal environment using different features of both natural ventilation and mechanical systems at different times of the day or season of the year. It is a ventilation system where mechanical and natural forces are combined in a two-mode system. The main difference between conventional ventilation systems and hybrid systems is the fact that the latter are intelligent systems with control systems that automatically can switch between natural and mechanical mode in order to minimise energy consumption and maintain a satisfactory indoor environment. "

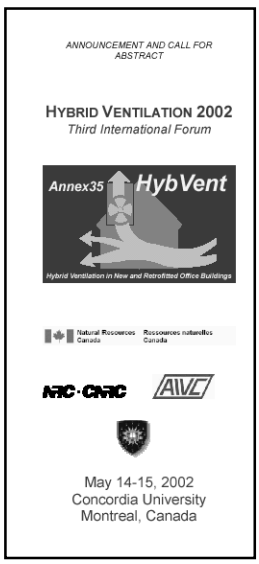
As far as control is concerned, various control strategies for hybrid ventilation systems may be important, e.g. :

- during certain periods of time, the control of the ventilation system is mainly determined by IAQ concerns,
- during other periods, temperature (indoor or outdoor) related control may be dominant.
- As far as research is concerned, it is important to mention two major international projects :
- International Energy Agency (IEA): Annex 35 'HYBVENT' of the Programme on Energy Conservation in Buildings and Community Systems (ECBCS)
- European Commission (EC): the RESHYVENT project from the Directorate-General Research

The HYBVENT project started in 1998 and will be finalised in the summer of 2002. This project, which is co-ordinated by Prof. Per Heiselberg from Aalborg University, is focused on hybrid ventilation concepts in **office buildings**. Organisations from 16 countries are involved in this project. A State-of-the-art report was published in 2001 was included on the September 2001 issue of AIVC-CD and can also be found on this issue of AIVC-CD.

The European RESHYVENT project just started in January 2002 and will run till 2004. This project, which is co-ordinated by P. Op't Veld from the Dutch consultancy firm Cauberg-Huygen, is focused on hybrid ventilation systems in **dwellings**. The





consortium includes industrial companies (Aereco, Alusta, Cox-Geelen, Flexit, IHB Bergschenhoek, Kanalflakt, Renson, Stigberget, Stork, Thermopanel) , consulting firms, universities and research organisations of 10 countries. A specific feature of this project is the fact that there are 4 industrial consortia, whereby each of these consortia intends to develop a hybrid ventilation system for specific market applications (e.g. from mild climates to cold climates).

European HOPE Project

The European project named HOPE (Health Optimisation Protocol for Energy-efficient Buildings: Pre-normative and socio-economic research to create healthy and energy-efficient building: contract no.: EUK6-CT-2001-00505) was started at the beginning of 2002. The fourteen participants from nine European countries have the challenge to answer the following questions in this three-year project:

- What is a healthy building and what is an energy-efficient building?
- What is an energy-efficient healthy building?
- Are buildings with energy saving measures energy-efficient? And what is the health status of buildings with energy saving measures as compared to buildings without energy saving measures?
- How can we assure that buildings are healthy and energy-efficient at the same time?

The final goal of the project HOPE is to provide the means to increase the number of energy-efficient buildings that are at the same time healthy.

A set of performance criteria for healthy and energy-efficient buildings will be developed, based on available knowledge. These criteria will be tested in existing buildings by performing a multi-disciplinary study in 180 office buildings and multi-apartment buildings, of which approximately 75% have been designed to be energy-efficient, followed by a detailed study in at least 32 of the investigated buildings. With the outcome, a methodology for assessing the performance of buildings according to this set of criteria will be defined. Furthermore, a set of health-energy integrated guidelines to improve unhealthy or low energy-efficient buildings will be generated for direct input in CEN activities. A Web-site will be created for the public which will include the results of the project and the possibility for non-participants to make their own multi-criteria analysis of how healthy and energy-efficient their building is, as compared to the investigated buildings. A protocol including the guidelines for improving an unhealthy and low energy-efficient building will be made for architects, building managers and maintenance persons. And, additionally, international and national dissemination activities will be performed.

HOPE is partly sponsored by the European Union in the JOULE programme (DGXII) under the management of Dr. G. Deschamps. The co-ordination is done by Dr. Philomena M. Bluyssen from TNO Building and Construction Research in The Netherlands. Other participants are: Weerdenburg Huisvesting Consultants and Technische Universiteit Eindhoven (TU/e) (The Netherlands); University of Porto (Portugal); Danish Building and Urban Research (Denmark); Technical University of Berlin (Germany); Helsinki University of Technology and Technical Research Centre of Finland (VTT) (Finland); University of Milano (Italy); Building Research Establishment (United Kingdom); Charles University of Prague (Czech Republic); EPFL: Swiss Federal Institute of Technology Lausanne (EPFL), E4Tech Sarl and Vaudois University Hospital Centre (Switzerland).

CIB W77

Within CIB, a whole range of working groups are operational. One of these working groups (W77) deals with the issue of indoor climate and this working group is coordinated by Dr. Erhard Mayer from the Fraunhofer Institut für Bauphysik, Germany

The objectives of W77 are :

- To promote research aimed at a better understanding of the effects of indoor climate on people, so as to be able to derive the quantitative criteria required for thermal comfort and air quality, taking into account interactions between disciplines
- To stimulate and facilitate the international exchange of ideas
- To try to transfer knowledge to practitioners

On the CD-ROM, more information about W77 can be found, including the conditions for participation. A meeting of W77 is scheduled in relation to the Indoor Air conference in Monterey, USA.

STANDARDS AND REGULATIONS

Update on the Envisaged European Directive on Energy Performance

As already announced in the September issue of AIR, the European Commission made available in April 2001 a proposal for a Directive on Energy Performance. The text proposed by the European Commission can be found on the AIVC CD.

The main features of this new directive are described in article 1:

“This Directive lays down requirements as regards

(a) the general framework for a methodology of calculation of the integrated energy performance of buildings,

(b) the application of minimum requirements[1] on the energy performance of new buildings,

(c) the application of minimum requirements on the energy performance of large existing buildings that are subject to major renovation,

(d) energy certification of buildings, and

(e) regular inspection of boilers and of air-conditioning systems in buildings and in addition an assessment of the heating installation in which the boilers are older than 15 years.”

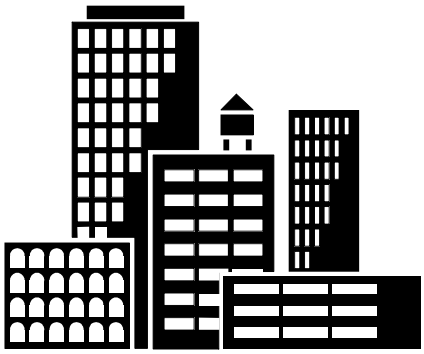
In practice, this means that :

- all member states must implement procedures for the determination of the energy performance of buildings,

whereby attention must be paid to indoor climate conditions;

- such procedures must be applied in all member states to all new and existing buildings;
- minimum energy performance requirements must be imposed for new buildings as well as for large existing buildings which are renovated;
- energy performance certificates must be available for all buildings.
- regular checks of heating boilers and central HVAC systems.

As far as the energy performance calculation is concerned, the directive



specifies that the following elements have to be taken into account :

- thermal characteristics of the building (shell and internal partitions, etc.). These characteristics may also include air tightness;
- heating installation and hot water supply, including their insulation characteristics;
- air-conditioning installation;
- ventilation;
- built-in lighting installation (mainly the non-residential sector);
- position and orientation of buildings, including outdoor climate;
- passive solar systems and solar protection;
- natural lighting and natural ventilation;
- designed indoor climate.

The envisaged directive also pays attention to indoor climate conditions : 'These requirements should take account of general indoor climate conditions in order to avoid possible negative effects such as inadequate ventilation.'

Discussions about this proposal for a directive have taken place at various levels. The European Council of Energy Ministers approved the proposal on December 4 2001 in a first reading (including comments for modification). The European Parliament has also approved the proposal in a first reading (with also comments for modifications) in February 2002. It is now up to the European Commission to make a new proposal. We will keep you informed about the further developments. Info can also be found on the website of the SAVE-ENPER project.

On the AIVC CD: Directive proposal and Opinion of the Economic and Social Committee on the Proposal

New European Standards from CEN TC 156

Five new European standards have very recently been published related to ventilation in buildings.

They have been prepared by Technical Committee 156 of CEN (European Committee for Standardisation).

Their references and titles are as follows :

- EN 13180:2001: Ventilation for buildings – Ductwork – Dimensions and mechanical requirements for flexible ducts
- EN 13053:2001 : Ventilation for buildings – Air handling units - Ratings and performance for units, components and sections.
- EN 13030:2001 : Ventilation for buildings – Terminals – Performance testing of louvres subjected to simulated rain
- EN 12236:2002 : Ventilation for buildings - Ductwork hangers and supports - Requirements for strength
- CR 14378:2002 : Ventilation for buildings - Experimental determination of mechanical energy loss coefficients of air handling components

For list of standards from TC 156, see the AIVC CD

On Site Measurement of Air Filter Performance

Air filters are often used to reduce indoor particle concentrations, one of the main indoor air pollutants.

Air filter performance is usually measured in the laboratory, but it is also useful to check the proper operation of filters within HVAC systems by measuring their efficiency on site.

Such an on site measurement method is described by the EUROVENT 4/10 recommendation (1996) - *In situ determination of fractional efficiency of general ventilation filters* - which gives guidelines for air flow rate and fractional efficiency (the filtration efficiency by particle size) measurement. The method applies to a single filter or to a complete installation with several filters. It uses an upstream and downstream sampling line, a sample dilution system and an optical particle counter. It is appropriate for particle sizes from 0.2 to 1 mm.

Measurement of air filter performance on site is quite an easy operation, even if special care has to be given to the use of the optical particle counter (coincidence error may occur if a dilution system is not used).

CETIAT has validated EUROVENT 4/10 recommendation by testing three different filters (G4, F6 and F8 classes according to EN 779 standard) and showing a good agreement between filtration efficiency measured on atmospheric aerosols and the one measured on latex aerosol. See the slide presentation on the CD Rom for more information .

The fact that the EUROVENT 4/10 recommendation is validated is important because it allows us to carry out accurate on site measurements and because it is well known that the field filter performances are not the same as those measured in laboratory due to different loading dusts (the laboratory loading dust does not reflect the loading characteristics of the natural dust).

The EUROVENT 4/10 recommendation should more often be used in indoor air quality studies. Measurement of the on site fractional efficiency of filters along with more common measurements (temperature and humidity of air, particulate and gaseous pollutant concentrations, air flow rate of the HVAC installation, etc.) gives a good

understanding on how the HVAC installation operates.

BOOKSHOP

A Review of International Ventilation, Airtightness, Thermal Insulation and Indoor Air Quality Criteria

Mark J Limb

AIVC Technical Note 55, 2002, 203 pp, Code TN 55

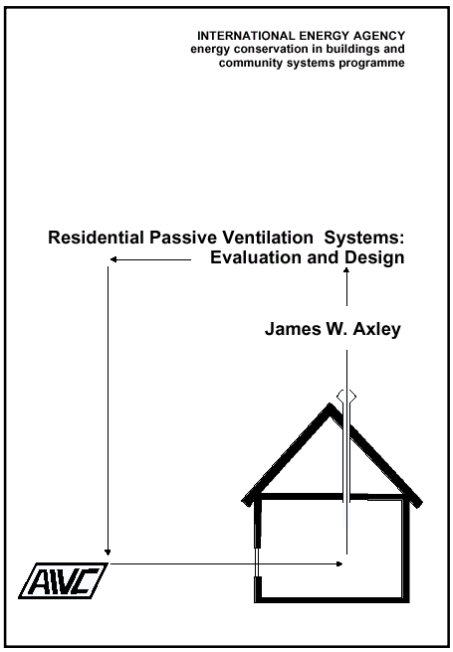
This review attempts to summarise available airtightness, minimum ventilation rate and indoor air quality requirements, standards, codes of practice and regulations. It also attempts to determine the nature and type of thermal insulation requirements and the rationale behind the data outlined in this report. Attempts have also been made to normalise the data, where appropriate to enable comparisons to be undertaken.

See also www.aivc.org for a list of all technical notes.

Residential Passive Ventilation Systems: Evaluation and Design

A Critical Evaluation of the Potential for Adapting European Systems for use in North America and Development of a General Design Method

James W Axley



AIVC Technical Note 54, 2002, 158 pp, Code TN 54

Infiltration has long served the residential ventilation needs in North America. In Northern Europe it has been augmented by purpose-provided natural ventilation systems - so-called passive ventilation systems - to better control moisture problems in dwellings smaller than their North American counterparts and in a generally wetter climate. The growing concern for energy use, and the environmental impacts associated with it, have however led to tighter residential construction standards on both continents and as a result problems associated with insufficient background ventilation have surfaced.

Recognizing the energy penalty of uncontrolled natural ventilation, building researchers and practitioners in North America are turning to mechanical systems to provide the necessary ventilation for air quality control. Northern Europeans are following suit but have not completely abandoned the passive ventilation methods that have served them for the past century. Research programs have been initiated in Britain, The Netherlands and France, in particular, to improve the understanding and performance of these traditional and largely empirically-based ventilation methods in the hope that they can more reliably provide basic background ventilation while avoiding the energy penalty associated with uncontrolled over-ventilation.

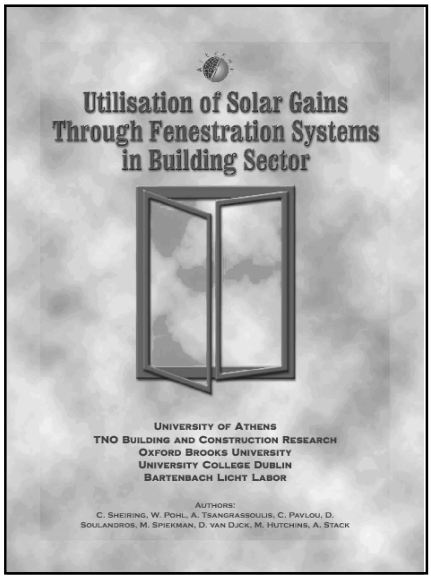
This state of affairs begs, then, a simple question:

Can European passive ventilation systems be adapted for use in North American dwellings to provide ventilation in an energy conservative manner?

This Technical Note attempts to answer this question. The configuration, specifications and performance of the preferred European passive ventilation system - the *passive stack ventilation* (*PSV*) system - will be reviewed; innovative components and system design strategies recently developed to improve the traditional PSV system performance will be outlined; and alternative system configurations will be presented that may better serve the climatic extremes and more urban contexts of North America. While these innovative and alternative passive ventilation systems hold great promise for the future, a rational method to size the components of these and other systems to achieve the control and precision needed to meet the conflicting demands of new ventilation and airtightness standards has not been forthcoming. Such a method will be introduced in this Technical Note, based on a review of existing simulation and design methods, and a series of applications of this method will be presented. Finally, provisions of the new *International One- and Two-Family Dwelling Code* that are likely to relate to the installation of passive ventilation systems will be reviewed and proposals for changes to this code will be put forward. See also www.aivc.org for a list of all technical notes.

The Utilisation of Solar Gains Through Fenestration Systems in the Building Sector.

Windows have always played an important role in architectural design. Their operation was primarily the provision of light, view and comfort. After the 1970's energy crisis, building regulations have changed in order to enforce energy efficient building design. At that time, windows presented very poor thermal resistance, optical and airflow characteristics. Innovations in glass and film technology, and later in frame construction, have seriously improved windows' physical characteristics.



Windows are the prime devices of a building in terms of heat and light exchange with the environment. In some cases, windows are also the source of fresh air in buildings. This natural ventilation can be manually or

automatically controlled for operable windows and this technique is used in hot and moderate climates.

These different window specifications and many others are presented in a new publication written in the frame work of the European Save FENESTRATION project. This project was carried out by the University of Athens, TNO Building and Construction Research, the Oxford Brooks University, the University College Dublin and Bartenbach Licht Labor.

The full document is available on the AIVC CD.

Indoor Air Quality in the Home

The MRC Institute for Environment and Health, based at the University of Leicester in the UK, has recently placed on its website a report summarising its findings on the potential consequences to human health of a range of air pollutants present in the domestic environment.

The report provides information on - and prioritises the significance to health of - airborne particles, bacteria, carbon monoxide, formaldehyde, fungi, house dust mites (and other aeroallergens), medium density fibreboard, nitrogen dioxide, pesticides, polycyclic aromatic hydrocarbons, and volatile organic compounds. In addition, the report address issues relating to the labelling of household products, and the influence of indoor air pollution on the health of young children. The report also identifies outstanding research needs in relation not only to the individual pollutants, but also with regard to several generic aspects of indoor air quality.

The assessment is based upon an extensive programme of work undertaken by the Institute for the (then) UK Department of Environment, Transport and the Regions (DETR).

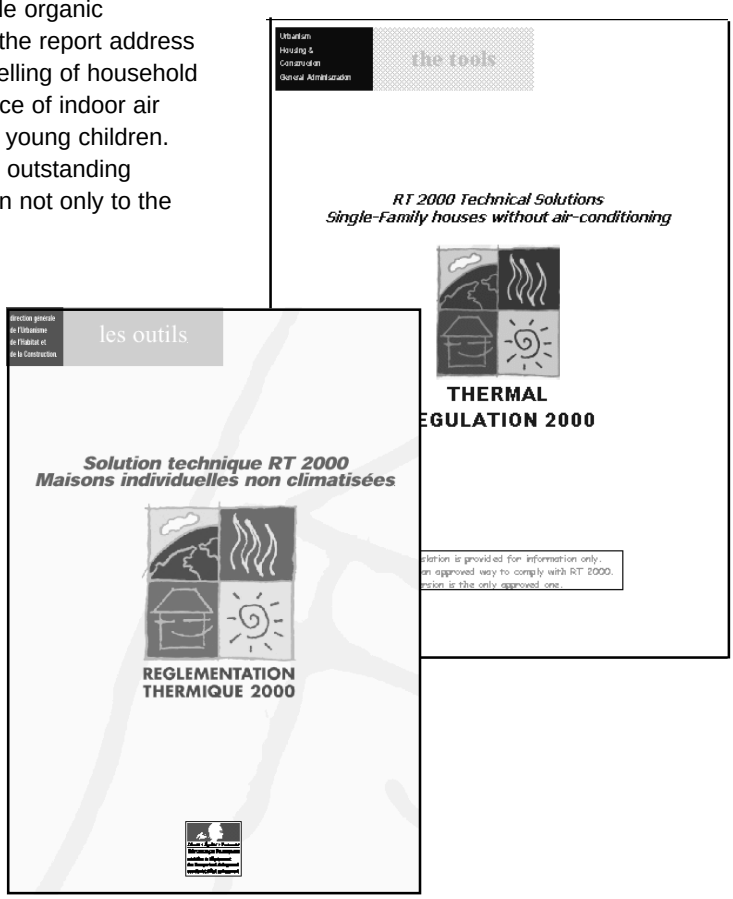
More detailed reports on a number of the individual pollutants considered are also available from the Institute, as detailed on the website, and advisory leaflets on indoor air quality and volatile organic compounds are available for free download. See also the Institute's meeting report on 'The issues and implications of setting and applying indoor air quality guidelines'.

The full document is on the AIVC CD.

Robust Construction Details

The section of the England and Wales Building Regulations, that covers conservation of fuel and power, Approved Document L, was extensively revised in 2001 as part of the UK government's commitment to the Kyoto process. The new document, which was published in October 2002 to come into force on April 1st 2001, puts much more emphasis on control of thermal bridging and air leakage than previously.

To provide guidance to architects, a series of 120 building details have been developed by the UK construction industry in collaboration with BRE. These have been published, in loose leaf format, as 'Limiting thermal bridging and air leakage: Robust construction details for dwellings and similar buildings', The Stationery Office, London 2001. The details are designed to minimise both thermal bridging and air leakage in domestic constructions. Demonstrating that a proposed building contains these details, allows compliance with the regulations. Otherwise it is necessary for the designer to calculate surface temperature factors (f-value) and linear thermal transmittances (Y-value) for each detail, and, in buildings of floor area greater than 1000m^2 carry out air leakage testing and infrared surveys.



Technical Solutions. An Easy Way to Apply New French Energy Regulations.

The new French Energy regulations (RT2000) are applicable to new residential and non residential buildings. They replace the former regulations for all building permits since June 2001.

Two main ways are provided to apply these regulations:

1) The standard way is to use software to calculate the energy consumption C and the indoor temperature in summer Tic and to check that they are lower than the maximum values defined by the regulations. This standard way offers a lot of flexibility and enables designers to optimise their projects. It needs well trained designers.

2) The simplified way consists of applying one of the approved « technical solutions ». Technical solutions can be prepared by anyone but must be approved by the French Department of Construction to become an official mean to apply the regulation.

A translation of the first approved technical solutions is presented on the CD. These technical solutions are applicable to single family houses. They offer a very simple way of fulfilling the requirements and take into account insulation as well as heating system, domestic hot water and ventilation system characteristics.

These technical solutions can be compared to the classical "U value approach" applied in many countries to set up regulations in simple buildings. As compared to this

(Continued on page 10...)

Now Heading for the 23rd AIVC Conference

EPIC2002AIVC

"ENERGY EFFICIENT AND HEALTHY BUILDINGS IN SUSTAINABLE CITIES"

HILTON LYON, Lyon, France, 23 -26 October 2002
the joint conference of the
3rd EUROPEAN CONFERENCE ON ENERGY PERFORMANCE AND INDOOR CLIMATE IN BUILDINGS

and the 23RD CONFERENCE OF THE AIR INFILTRATION AND VENTILATION CENTRE

Purpose

Improving the environmental performance of buildings is a challenge for the future. As part of the sustainable development of the society, also the built environment have to perform in a better way. Therefore the improved integration of buildings in their urban context, and the rational use of the environment for building purposes (rational use of energy sources and materials, energy efficiency of installations and building components, adaptation to local micro climate, minimization of environmental impact) and achieving a healthy and comfortable indoor climate are major objectives.

Research and demonstration projects and initiatives have been developed in many countries during the last decade. A new generation of integrated simulation tools and simplified design guidelines is being developed for the evaluation of the indoor climate and environmental impact of building components and/or whole buildings. These experimental examples and assessment tools are important aids for evaluating new products as well as full building and urban designs.

The EPIC Conference builds further on the experiences of the former events organized in 1994 and 1998,and bundles the efforts with the annual conference of the AIVC on ventilation and indoor air quality research.

Aims of the conference

The aims of this conference are :

- to create a discussion forum where most recent results of research and development in the fields of rational use of local or global environment of buildings are confronted with the views and the needs of industry and practice oriented professionals;
- to inform the European building community on the latest developments in the research as well as in the practical application of new building products and evaluation tools;
- to discuss the possibilities for guidelines and standardization of assessment methods and global environmental quality requirements on a European-wide level.

To achieve this, a combination of full and short oral sessions is foreseen as well as 12 workshops focusing on specific discussion items.

Who Should Attend?

The conference is aimed for the following target audience:

- Industrial manufacturers and developers of building components
- Consultant engineers
- Designers and architects
- Researchers
- Building and housing estate managers
- Policy makers and officials involved in housing, construction and energy
- People involved in standardization

Programme

The four day programme for this conference comprises :

- Full plenary sessions for the opening and closing sessions
- Parallel sessions with:

  EOP: extended oral presentations,12 minutes per paper

  SOP: short oral presentations, a 3 minute introduction to the poster on dislay.

These posters will be on display for the duration of the session.

- Workshops on selected topics, where the views of research and industry will be confronted.

Keynote lectures

Each full oral session will start with an invited lecture by a representative of one of the leading organisations in the building sector, such as the IEA , the European Construction Forum, ASHRAE, CIBSE, the French national and regional (Région Rhone-Alpes) authorities, renown architects, IBPSA, etc. They will address the issue of energy performance and indoor climate in buildings with a view to past, present and future developments.

Workshops

In parallel with the oral and poster presentation sessions, a series of attractive workshops is organised on selected topics, as listed below. This concept of thematic workshops was highly appreciated by the participants at the previous EPIC conferences in 1994 and 1998. These workshops bring together a number of specialists with various viewpoints from either science or industry on the selected topic in a confronting debate.

Workshop topics

1. Energy Performance Regulations
2. Hybrid ventilation
3. Environmental performance assessment of building components
4. Sustainable urban planning
5. Glazing and active facades
6. Natural ventilation in urban settlements
7. Design of large buildings of high environmental quality
8. Contributions and challenges of the 'information society' to environmental quality
9. IAQ criteria for sustainable buildings
10. Indoor climate and economy
11. Air distribution systems, health and energy
12. Opportunities and barriers for the integration of renewable energies in the built environment

Conference Dinner

A Conference Dinner will be organized on the evening of October 25 at a cost of about 80 • per person.

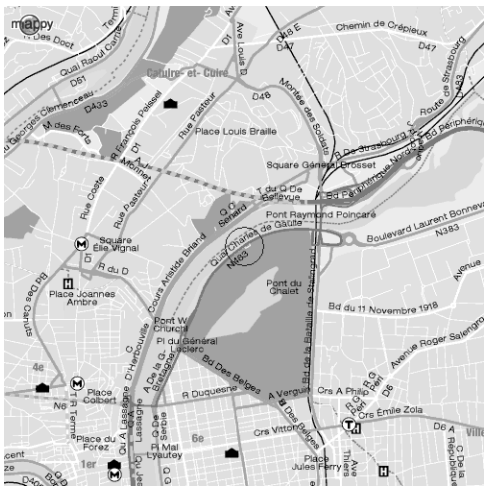
The location will be the prestigious Château de Saint Priest, close to Lyon.

Exhibition

There is limited space available for commercial exhibitors to demonstrate products, software, measurement equipment, publications related to the themes of the conference. Ask the conference secretariat for conditions.

Venue

The EPIC 2002 AIVC Conference will be held at the Hilton Lyon hotel, situated in the heart of the Cité Internationale. See the map.



Registration fees

If paid before 1st July 2002

Contributing authors - 600 EUR
Full participants - 600 EUR
Students - 300 EUR

If paid from 1st July 2002 on:

Contributing authors - 700 EUR
Full participants - 700 EUR
Students - 350 EUR

One full registration fee by participant is required. Papers submitted without payment of the registration fee will neither be printed in the conference proceedings nor included in the technical programme.

The fee covers:

- attendance at all oral sessions, poster sessions and workshops
- coffee and lunches during the Conference
- invitation to the Reception in the City Hall of Lyon
- the book of Proceedings and CD-Rom

Organizing Committee

The Conference is jointly organized by

LASH (Building Sciences Laboratory), Ecole Nationale des Travaux Publics de l'Etat, Vaulx en Velin, France

INIVE EEIG (International Network for Information on Ventilation) on behalf of AIVC, Brussels, Belgium

Gérard Guarracino (chairman),ENTPE, Vaulx-en-Velin, France

Peter Wouters (chairman), INIVE EEIG, BBRI, Brussels, Belgium

Francis Allard (scientific chairman),Université de La Rochelle, France

Mat Santamouris (scientific chairman),University of Athens, Greece

Jean-Robert Millet, CSTB, Marne la Vallée, France

François Durier, CETIAT, Lyon, France

Luk Vandaele, BBRI, Brussels, Belgium

Conference Secretariat

Laboratoire des Sciences de l'Habitat,
Département Génie Civil et Bâtiment,CNRS URA 1652,
Ecole Nationale des Travaux Publics de l'Etat,
Rue Maurice Audin,
F -69518 Vaulx-en-Velin FRANCE
Tel :+33 (0)4 72 04 70 27
Fax :+33 (0)4 72 04 70 41

E-mail :epic2002aivc@entpe.fr
Website: http://epic.entpe.fr or www.aivc.org

Scientific Committee

The list of the members of the scientific committee is given on the conference flyer (available on the AIVC CD)

Hotel Information

A contingent of rooms has been reserved for Conference participants and accompanying persons at the Hilton Hotel. Please refer to the information available on the Web site. Further information on other categories of hotels is also available at the Conference Secretariat.

Languages

English will be the official language. Simultaneous translation in English and French will be provided for the opening and closing sessions.

Conference Proceedings

All accepted papers will be published in the Conference Proceedings which will be distributed at the Conference.
Best papers will be published in a special issue of a scientific journal.

After the Conference, a CD-Rom including all papers, summaries of workshops and selected presentations, will be sent to all participants.

The next announcement and preliminary programme will be available in July 2002.

Schedule

Wednesday 23rd October 2002				
	1	2	3	4
Morning	Technical visit to CETIAT (optional)			
12:00 – 14:00	Registration			
14:00 – 15:30	Opening session			
	Coffee break			
16:00-17:30	EOP 1		Workshop 1	Workshop 2
19:00	City hall reception			
Thursday 24th October 2002				
9:00-11:00	EOP 2	SOP 1	Workshop 3	Workshop 4
	Coffee break			
11:30-13:00	EOP 3	EOP 4	SOP 2	SOP 3
	Lunch			
14:30-15:30	EOP 5	EOP 6	SOP 4	SOP 5
	Coffee break			
16:00-18:00	SOP 6	EOP 7	Workshop 5	Workshop 6
Evening	Technical visit to CETIAT (optional)			
Friday 25th October 2002				
9:00-11:00	EOP 8	SOP 7	Workshop 7	Workshop 8
	Coffee break			
11:30-13:00	EOP 9	EOP 10	SOP 8	SOP 9
	Lunch			
14:30-15:30	EOP 11	EOP 12	SOP 10	SOP 11
	Coffee break			
16:00-18:00	SOP 12	EOP 13	Workshop 9	Workshop 10
20:00	Conference dinner at Château Saint Priest			
Saturday 26th October 2002				
9:00-11:00	EOP 14	EOP 15	Workshop 11	Workshop 12
	Coffee break			
11:30-13:00	Closing session			
	Buffet Lunch			

EOP - Extended Oral Presentation
SOP - Short Oral Presentation

(Continued from page 7)

approach the technical solutions offer three main advantages:

- They remain simple and applicable to small simple buildings
- They cover the building shell as well as the characteristics of heating domestic hot water and ventilation systems,
- They enable trade-offs between these different characteristics.

In order to facilitate the choice of efficient products by builders who are not specialist in energy, the performance of the products are defined using certification marks.

Other technical guidelines will probably be produced by industrial companies within the next months.

The full document is on the AIVC CD.

Testing Buildings for Air Leakage

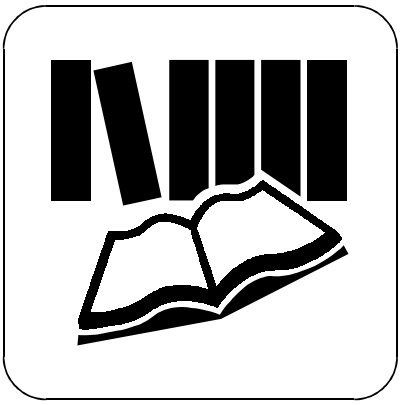
In the past, buildings were "leaky" and much of the required ventilation was provided by this fortuitous air leakage. Modern building construction however, aims to provide an airtight envelope in order for controllable ventilation to eliminate cold draughts, prevent polluted air entering the building and to increase energy efficiency. This last point in particular will be of considerable importance in the UK, when the new Part L of the Building Regulations comes into force in April 2002. Part L specifically addresses the energy efficiency of buildings by looking at the conservation of fuel and power. The Regulations will demand increased standards of detailed design and site workmanship to ensure improved thermal performance and they also introduce standards of air-tightness.

CIBSE were involved in the governmental consultation process and have **produced TM 23: testing buildings for air leakage**, which describes how by understanding and appreciating the need for airtight construction in the early stages of design, building engineers and designers will achieve the high controllable ventilation standards demanded by clients and soon by the new Part L. This publication explains why air leakage testing is important, sets out acceptable rates of air filtration and explains what can be done should a problem be discovered.

The CIBSE "Ventilation MOT"

Services professionals, facilities managers and product suppliers know the importance of regular maintenance of mechanical ventilation systems. It is essential to promote good air quality for the health and comfort of the occupants and to ensure that the system is working as efficiently as possible. The technical knowledge needed to maintain mechanical ventilation systems is widely available within the services industry, but it is often not well employed because of a lack of understanding by building owners and operators of the benefits of regular maintenance.

In September 2000, CIBSE (The Chartered Institution of Building Services Engineers) began developing an "MOT" for ventilation systems in non-domestic buildings to give



facilities managers a practical tool for regular checking of their ventilation systems. (In the UK the 'MOT' is the annual safety test that all cars must pass in order to use the public roads) For the Ventilation MOT, the approach is to identify a basic set of tests that can be carried out routinely, and further actions that may be used in specific types of building or where the initial tests indicate that further investigation may be needed. CIBSE hope to publish the results early in 2002

The tool comprises a checklist and standard method outlining the tasks and procedures necessary to maintain a ventilation system. It is designed to highlight problems so they can be solved. Anticipated benefits of using the tool include:

- Cost benefits from a planned deployment of maintenance resources rather than crisis management,
- Improved productivity due to systems operating as designed without occupant intervention,
- Reduced energy and maintenance costs of properly specified, installed and maintained systems,
- Enhanced occupant satisfaction and productivity, which will outweigh the cost of the whole exercise in many buildings.

The routine tests can be used to ensure the satisfactory performance of mechanical ventilation systems and can be carried out either in-house or by an external contractor.

A key element of the project has been the use of "Focus Groups" of practitioners with an interest in the project to guide the development. One of the key messages to emerge from these discussions has been to keep the "MOT" simple and practical.

The project is being part funded by the DTI through the "Partners in Innovation" scheme. It has acquired increased importance with the recent publication of the draft European Directive for Energy Performance in Buildings, which is likely to make the introduction of such regular testing essential. DEFRA is currently consulting on the Directive, and details can be found on the DEFRA website in the "Consultations" area.

CIBSE is a UK based charity which exists to promote the art, science and practice of building services engineering and is further committed to developing better modern buildings through professional development, research and communication. It has over 15,000 members in the UK and world-wide who work in all fields of building services including lighting, heating, cooling and transport systems . Building services typically account for some 50% of the cost of the building and CIBSE is keen to reach out to all those involved in Building Services and energy efficiency in buildings, be it in design, construction or maintenance areas, by providing an entry to a network of professionals working throughout the construction and engineering industries. It also provides a wide range of expert technical publications on subjects from Legionnella to Lighting for hazardous environments and offers a full programme of conferences and seminars detailing the

latest research and practical developments in the field of building services.

Special groups exist within CIBSE covering specific areas of professional interest and expertise such as daylighting; electrical services, facilities management; heritage, IT, lifts, natural ventilation, project management, public health engineering and thermal storage and also the Society of Light and Lighting which caters for the interest of illumination experts.

Further information can be found at the CIBSE website.

Recent publications from CIBSE include: -

CIBSE Concise Handbook: enabling the fast location of fundamental building services design information

Guide B/Section 2: Ventilation and air conditioning - essential up-to-date best practice guidance

Guide C: REFERENCE DATA - which offers all the core data building services design calculations are based on -

Energy Efficiency CD-ROM - includes full text version of CIBSE's Guide F: Energy efficiency in buildings, Understanding building photovoltaics and much more

Commissioning of Air Systems in Buildings

BSRIA (United Kingdom) has updated the 3rd edition of its air commissioning guide to take into account new and revised standards and best practice guidance, plus details on the latest commissioning procedures and tools.

The Guide covers the four major and interlinked aspects of the commissioning process:

- Design – introduction, fan and ductwork system design, access and test holes,
- Installation – management, ductwork installation procedures, installation inspections, preparation for commissioning,
- Commissioning procedures – management, site test instruments, on-site flow measurement techniques, setting to work, on-site regulation procedure,
- Documentation – reporting, documentation, example pro formas. Concludes with a bibliography.

The latest commissioning equipment is also described along with application notes.

This Guide is one in a series of six commissioning guides produced by BSRIA over the past few years, covering also VAV, HVAC, water, and pre-commission cleaning and commissioning of pipework systems.

Displacement Ventilation: a New Guidebook

A guidebook about displacement ventilation has been very recently published by CETIAT (the French Technical Centre for the HVAC Industry) and EDF (Electricité de France).

The book describes the principles and advantages of displacement ventilation systems, including numerous colour drawings and photos.

It shows the different possible approaches to calculate a displacement ventilation system (from 'manual' evaluation methods to the use of CFD) and gives a description of its main components: air handling unit, sensors and controls, air diffusers.

It briefly presents several applications of displacement ventilation, in concert hall, restaurant, casino, industrial laundry.

The guide is written in French language. Its author, Anne-Marie Bernard (CETIAT), worked in close cooperation with industrial organisations and French research institutes joined together in an editorial committee. Hakon Skistad (SINTEF – Norway), who is the editor of the next coming Rehva displacement ventilation guidebook (see Air December 2001), wrote the foreword.

The book is available for purchase on line.

Belgian Advisory Network for Health Aspects of Building Materials - BANHAM

In some sectors, technologies and products are developing so quickly that most of the companies (mainly the small and medium-size firms) have difficulty in closely following the developments. That is the reason why some Belgian research centres, with the support of the three Belgian Regions, have created the so called "Technological Guidance Services". Their objective is to fill in the gap between the scientific research and industrial practice.

Given the new interest in the theme "Buildings and health" in different sectors, some of the Technological Guidance Services have decided to bring together their forces in order to lead to an efficient transfer of knowledge in this field.

The research centres involved are :

- The Coating Research Institute (CoRI)
- The Scientific and Technical Service Centre for the Belgian Textile Industry (Centexbel)
- The Technical Centre of Wood Industry (CTIB)
- The Belgian Building Research Institute (BBRI)

The diffusion of the information is done through a newsletter published twice a year in collaboration with the AIVC. The newsletter and the annex reports are available on the AIVC CD.


BÂTIMENT ET SANTÉ

N°2 Mars 2002

BANHAM - Belgian Advisory Network for Health Aspects of building Materials

Le bois, un matériaux écologique

Alain Grosfils CTIB

Aspects écologiques du nettoyage des façades

Rolf De Bruyn CSTC

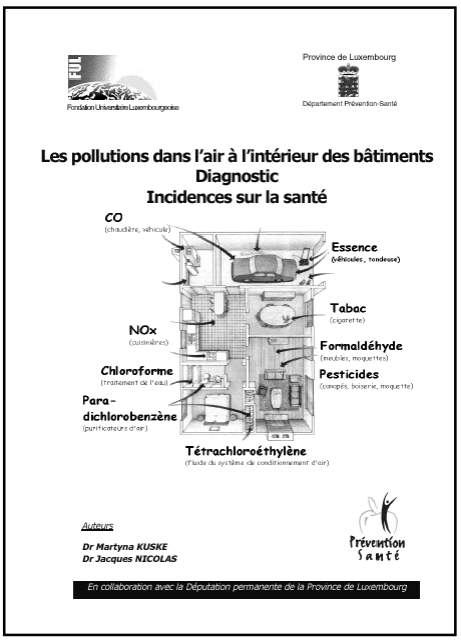
BANHAM

Bâtiment et Santé n°2 – Mars 2002

Indoor Air Pollution

It was only in the Seventies that some health problems were explained by the pollution inside buildings.

The oil crises stimulated a reduction of energy consumption, involving the intensification of the thermal insulation of houses and a reduction of the ventilation rate.



While the energetic objective may have been achieved, it should also be noted that the majority of these actions led to an increase in the concentration of pollutants in the indoor air.

These problems, generally known under the term 'Indoor Pollution', became the theme of many studies and publications. But to improve the situation, it is not enough to list, even to study the possible effects of the pollutants on health; it is necessary to take the appropriate decision to cure the problem.

This book tries to cover the question as a whole. It is the result of a bibliographic study of European and world publications covering the subject, of research reports, of FUL student works, of contacts with the institutions and organisations dealing with indoor pollution, as well as of personal experience in that field.

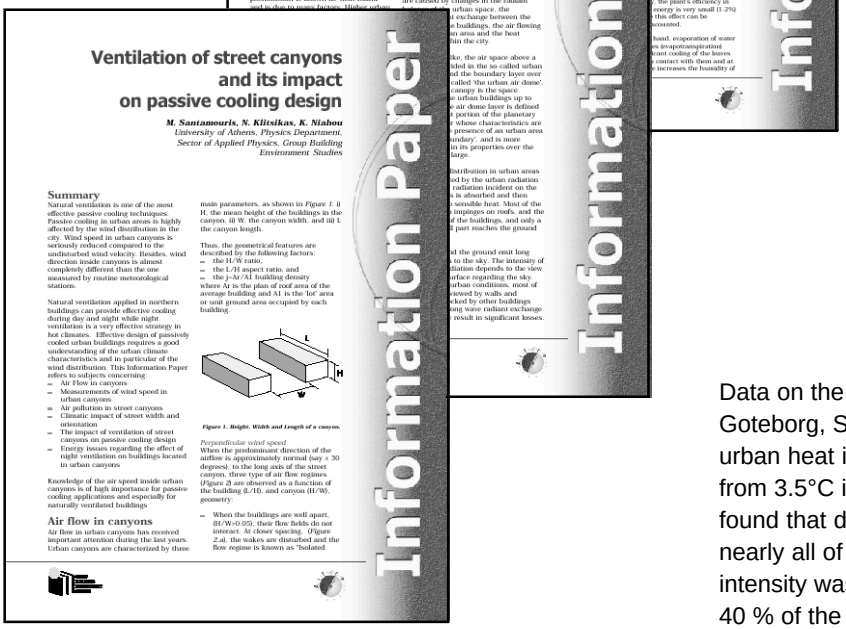
It is the fruit of a common reflection between the Province of Luxembourg Department Prevention and Health and the F.U.L., in the spirit of the installation of a service of intervention in the matter of indoor pollution. It is thus primarily addressed to all the professionals who are concerned with the question: not only operators and managers of such services, but also scientists, physicians, laboratories, authorities, security officers in companies, and so on

In about a hundred pages, the book synthetically lists the principal pollutants commonly met in houses, and more particularly in Belgium. It identifies their sources and their effects on health, as well as the regulation concerning them and some practical pieces of advice.

Compared to the information generally available in other works, this one adds the standard analysis methods as well as some alternative detection techniques for each pollutant, particularly those which are applicable in the field.

It is written by Martyna Kuske, Doctor in Medicine and Professor Jacques Nicolas, actual leader of the department "Environmental Monitoring" at Fondation Universitaire Luxembourgeoise, in Arlon.

The full document is on the AIVC CD.



Information Paper on 'The Heat Island Effect on Passive Cooling'

Air temperatures in densely built urban areas are higher than the temperatures of the surrounding rural country. The phenomenon is known as 'heat island' and is due to many factors. Higher urban temperatures have a serious impact on the electricity demand for air conditioning of buildings, increased smog production, and contribute to increased emission of pollutants from power plants, including sulfur dioxide, carbon monoxide, nitrous oxides and suspended particulates. Moreover, they may substantially reduce the potential of passive cooling strategies and in particular night time ventilation.

Numerous studies have been performed to analyze and understand heat islands. Most of the studies concentrate on night heat islands in the winter period, and few of the studies analyze the day period temperature field and summer heat islands.

Data on the heat island intensity in Goteborg, Sweden, show a well developed urban heat island of magnitude 5°C, ranging from 3.5°C in winter and 6°C in summer. It is found that during the summer season in nearly all of the night hours the heat island intensity was greater than 0.5°C and on the 40 % of the night hours it was greater than 1°C. Data on the heat island intensity in Malmo, Sweden provide a mean heat island intensity close to 7°C.

Information on the heat island intensity in Essen, Germany gives a heat island intensity between 3-4°C for both the day and night period. Measurements of the heat island in Fribourg, Germany, show that the intensity of the phenomenon is close to 10°C.

Data on the heat island for various Swiss cities are reported. For Bale and Berne the heat island intensity was close to 6°C, while for Biel and Fribourg was 5°C, and for Zurich was close to 7°C. Finally, the use of satellite data for Rome provides important temperature differences between high-density urban areas and low-density urban and agricultural areas.

Thus, it becomes increasingly important to study urban climatic environments and to apply this knowledge to improve people's environment in cities.

This Information Paper refers to the main issues relating heat islands and their impact on the cooling requirements of urban buildings and on the potential of using passive and natural cooling techniques in the urban environment. It concentrates on the following major subjects:

- The urban climate
- Heat island effect and the main factors influencing it
- Heat island studies
- The effect of heat island in Athens region
- Energy consumption in urban spaces
- Energy impact of heat island effect on passively cooled buildings
- Solutions

The full document is on the AIVC CD.

Information Paper on 'Ventilation of Street Canyons and its Impact on Passive Cooling Design'

Natural ventilation is one of the most effective passive cooling techniques. Passive cooling in urban areas is highly affected by the wind distribution in the city.

Wind speed in urban canyons is seriously reduced compared to the undisturbed wind velocity. In addition, wind direction inside canyons is almost completely differentfrom the one measured by routine meteorological stations.

Natural ventilation applied in northern buildings can provide effective cooling during day and night while night ventilation is a very effective strategy in hot climates. Effective design of passively cooled urban buildings requires a good understanding of the urban climate characteristics and in particular of the wind distribution.

This Information Paper by M. Santamouris, N. Klitsikas and K. Niahou refers to subjects concerning:

- Air flow in canyons
- Measurements of wind speed in urban canyons
- Air pollution in street canyons
- Climatic impact of street width and orientation
- The impact of ventilation of street canyons on passive cooling design
- Energy issues regarding the effect of night ventilation on buildings located in urban canyons

Knowledge of the air speed inside urban canyons is of high importance for passive cooling applications and especially for naturally ventilated buildings.

The full document is on the AIVC CD.

Information Paper on 'Use of Vegetation and Water to Promote Passive Cooling'

Increasing urbanisation and industrialisation have deteriorated the urban environment. Deficiencies in development control have important consequences on the urban climate and the environmental efficiency of buildings.

The size of housing plots have been reduced, thus increasing densities and the potential for traffic congestion. Increasing numbers of buildings have crowded out vegetation and trees.

As a consequence of heat balance, air temperatures in densely built urban areas are higher than the temperatures of the surrounding rural country. The phenomenon is known as 'heat island' and its main effect on the urban environment is to increase temperatures especially during the summer period.

The impact of the urban climate on the energy consumption of buildings for cooling purposes is tremendous. A negative urban environment has a direct negative influence on the envelope loads due to the increase of conduction loads and radiation loads mainly through fenestration. On the other hand, the potential use of natural ventilation can be seriously reduced due to the increase of the air temperatures and the low air velocity at street level. Finally, the increase of the temperature originates a reduction in the COP of the HVAC systems.

In this aspect, the more attractive, powerful, disseminated and easy to use renewable energy source in the urban environment is the use of vegetation and water. Vegetation and water bodies for cooling purposes can be considered as a renewable heat sink, in a similar way that the sun is a renewable heat source for heating purposes.

This Information Paper by S. Alvarez, F.J. Sanchez , D. Velazquez and L. Perez-Lombard refers to subjects concerning:

- Physical principles;
- Urban heat sinks;
- The importance of landscaping (vegetation and shading, vegetation in courtyards, vegetation and wind, ponds with fountains);
- Building related aspects (roof-ponds, roof-gardens)

The full document is on the AIVC CD.

MEETINGS AND EVENTS

International Conference on System Simulation in Buildings

The 6th International Conference on System Simulation in Buildings will be organized in Liège (Belgium) from 16 to 18 December 2002 under the scientific and technical sponsorships of the ASHRAE and of the International Energy Agency.

A total of 54 abstracts have been already collected and are now in the reviewing process.

A provisional program will be issued at the end of March 2002.

The number of participants will be limited to 50, in order to guarantee the quality of the discussions.

It is expected that 30 to 40 papers will actually be presented at the conference and will be spread among the following topics:

- Building modelling
- HVAC components and system modelling
- System simulation methods and tools
- Application to control

- Application to energy management and to maintenance
- Application to commissioning and retrofit.

The final program will be issued in September 2002.

All practical information can be found on the web site of the Thermodynamics Laboratory of the University of Liège.

The 7th International Symposium on Ventilation for Contaminant Control will be held at Hokkaido University in Sapporo, Japan, August 5 to 8, 2003.

The aim of this symposium is to bring together prominent researchers from universities and institutes, engineers from industry, government officials, with the goal of experiencing the latest techniques for measuring and analysing indoor air flow patterns, the evaluation of ventilation parameters and the most recent developments in computational simulation techniques of room airflow. The symposium will also see the launch of a new design guide book dealing with industrial ventilation applications. This is the result of major International Co-operation that has taken place over the past decade. This Design Guide Book (DGB) has been prepared by many leading international authors.

Ventilation 2003 encourages papers on any subject related to ventilation and airflow patterns in industrial premises, commercial kitchens, vehicle compartments, agricultural facilities and other occupied spaces including domestic and commercial buildings; system performance; air quality and thermal conditions, and their impact on productivity; as well as sustainability related issues. Each topic area covers research, development, design, new applications and equipment, case studies and future trends.

Forthcoming Conferences

Click here for a list of forthcoming conferences

AIVC Electronic Publications

A total of 58 AIVC Publications, including technical notes, annotated bibliographies, guides and conference proceedings are available on the CD, as well as a number of informative literature lists.

These documents represent the AIVC's output since its inauguration in 1979, and comprise a considerable bank of ventilation related information.

AIVC SPONSORS' CORNER

The new operating agent of the AIVC is offering the opportunity to sponsor the activities of the AIVC. This will be of direct benefit both for readers of AIR and for the sponsors themselves:

Sponsors will be able to reach **thousands of potential clients** directly interested in ventilation related products;

The sponsorship is one of the means that will enable the AIVC to provide more information at lower cost.

Three levels of sponsorship are possible (Gold, Silver and Bronze), corresponding to different contribution rates and advantages.

The main advantages for the sponsors are :

- Commercial advertisement in this newsletter
- Commercial information on the AIVC CD
- Sponsor's banner on the AIVC website
- Commercial leaflet distributed with this newsletter
- Free copies of this newsletter and the AIVC CD
- Free participation for sponsor's delegates at the annual AIVC conference
- Free exhibition stand at the annual AIVC conference

Detailed information concerning sponsorship is available on the AIVC-CD or on the AIVC website (*www.aivc.org*). A request for further information may also be sent to *inive@bbri.be*.

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EMAIL *info@renson.be*

Renson Has Created a New Brochure about the "Healthy Building Concept"

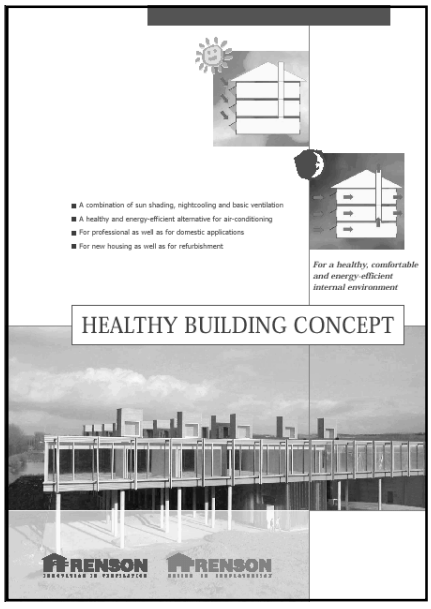
This new RENSON brochure clarifies the " Healthy Building Concept" which is aiming at a healthy indoor environment with a minimal use of energy.

You will learn how RENSON can offer an alternative for air-conditioned buildings during warm summer days, by using natural in combination with an effective sun shading system.

The brochure explains you first of all the principle of the "Healthy Building Concept" translated into practice by two interesting case-studies.

Finally, it is also explained how RENSON products and techniques can help you in achieving a Healthy Building.

Ask for a free copy of the brochure via *www.renson.be* or see it on the AIVC CD.



Air Information Review & AIVC-CD (4 issues per year)

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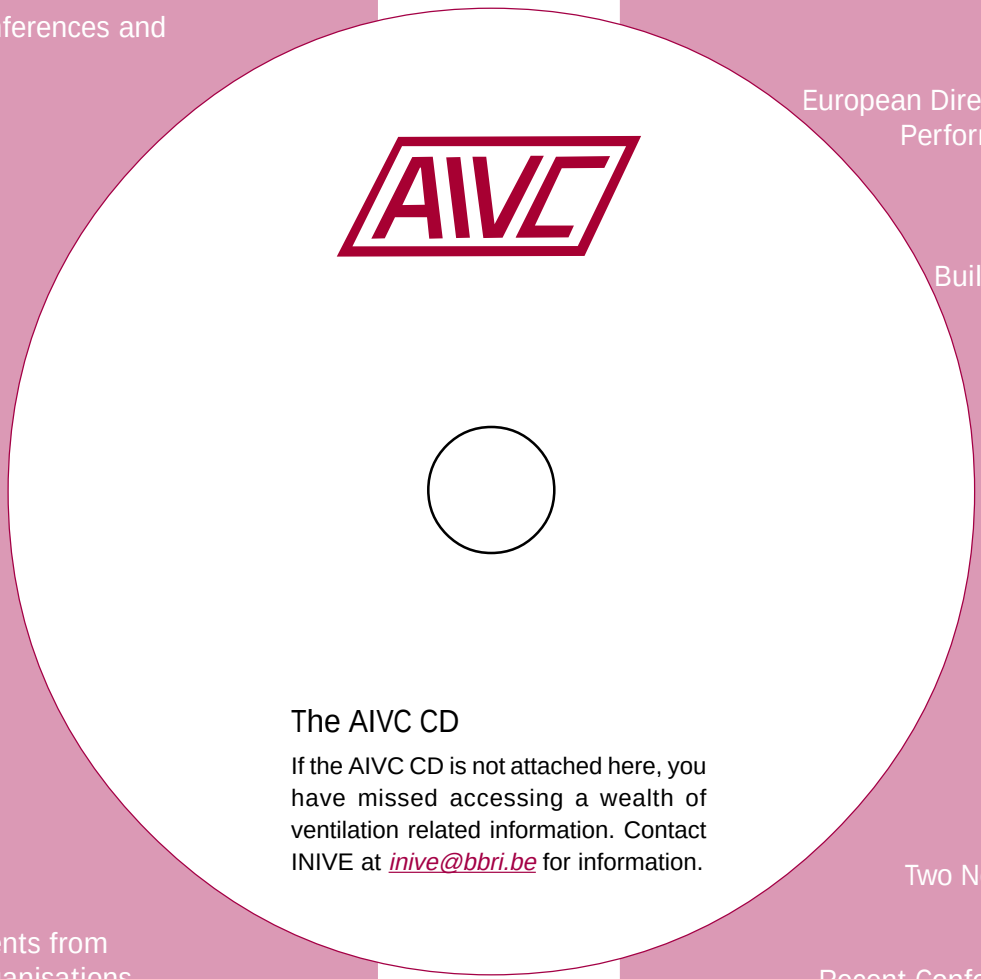

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