Free Web Edition

AIR INFORMATION REVIEW

Vol 24, No. 2, March 2003 A quarterly newsletter from the IEA Air Infiltration and Ventilation Centre

INSIDE

FEATURES
The AIVC CD ROM

European Energy Performance Directive approved

Major challenges and opportunities for ventilation and indoor climate!

P. WOUTERS - BBRI

On January 4 2003, the Official Journal of the European Communities published "DIRECTIVE 2002/91/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2002 on the energy performance of buildings". This directive is a major legal boundary containing conditions for future developments in Europe in the area of energy efficiency of buildings and, related to that, measures in relation to the indoor climate in buildings. Given the fact that ventilation, indoor air quality and energy are key aspects of this directive, the full text of the directive is included in this article as well as comments concerning ventilation and IAQ related issues.

The official text of the EPD is marked in black. Editorial comments are in red. On the CD-ROM, you will find the full text in 11 different languages.

(Continued on page 10…)

New AIVC Annotated Bibliography

Review of Airflow Measurement Techniques

AIVC Annotated Bibliography 12, 2003, 94 pp, Jennifer McWilliams

Airflow measurement techniques are necessary to determine the most basic of indoor air quality questions: "Is there enough fresh air to provide a healthy environment for the occupants of the building?"

This publication outlines airflow measurement techniques, but it does not make recommendations for techniques that should be used.

The airflows that are discussed are those within a room or zone, those between rooms or zones, such as through doorways (open or closed) or passive vents, those between the building and outdoors, and those through mechanical air distribution systems.

Techniques that are highlighted include particle streak velocimetry, hot wire anemometry, fan pressurization (measuring flow at a given pressure), tracer gas, acoustic methods for leak size determination, the Delta Q test to determine duct leakage flows, and flow hood measurements. Because tracer gas techniques are widely used to measure airflow, this topic is broken down into sections as follows: decay, pulse injection, constant injection, constant concentration, passive sampling, and single and multiple gas measurements for multiple zones.

Selected papers are annotated, and a bibliography is included for each topic with full abstracts.

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.

Published by:
Air Infiltration and Ventilation Centre
Operating Agent and Management
INIVE EEIG, Boulevard Poincaré 79
BE-1060 Brussels, Belgium
Tel: +32 2 655 77 11
Fax: +32 2 653 07 29
inive@bbri.be, http://www.inive.org

Preparation:
Christophe Delmotte & Peter Wouters

Editing: Erika Malu

Contributions to AIR: Suggestions for contributions are welcomed.

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

The subscription is for 4 issues of the newsletter, with accompanying CD, per year (starting in September) Issues are published in September, December, March and June.

1) AIVC Member Countries:
Belgium, France, Greece, Norway, Netherlands, USA
200 EUR/year (renewals at 100 EUR)

2) Non-AIVC Member Countries
400 EUR/year (renewals at 200 EUR)

3) A free version of AIR without any links is available at *www.aivc.org*

INIVE members distribute AIR & AIVC-CD for preferential rates (even free of charge) in their countries (Belgium, France, Greece, Norway). Contact INIVE for information (see page 16).

GUIDE TO THE NEWSLETTER

The Air Information Review is available in electronic format (PDF file) on the AIVC-CD. This electronic version is provided with hyperlinks to other documents located on the CD and to external web sites or e-mail addresses.

In the document, links are represented by small red icons or by red text.
To follow a link: position the pointer over the linked area on the page until the pointer changes to a hand with a pointing finger (the hand has a plus sign in it if the links point to the Web). Then click the link.

Content of the AIVC-CD
The AIVC-CD contains various AIVC products, such as the Air Information Review newsletter, Technical Notes, "Airbase" (the AIVC's bibliographical database) and recent conference proceedings. It also contains a lot of third party publications.

The content of the CD is summarised in a document called "What's on the AIVC-CD?". This document is also available on the CD and is provided with hyperlinks.

In order to have an overview of the content of all the AIVC-CD's, a compilation of their tables of content is now also available on the CD.

How to find information on the AIVC-CD
Once you have introduced the AIVC-CD in the CD-Rom driver of your computer, the index.html file should open automatically. (If this is not the case, you can find the file on the main root of the AIVC-CD and open it yourself). This file is provided with hyperlinks to other documents located on the CD.

To find information in a PDF document, you can use the Find command (Edit > Find) to find a complete word or part of a word in the current PDF document.

You can also use the Search command (Edit > Search > Query) to search for a word or combination of words through all the PDF files located on the AIVC-CD.

WEBSITES

British air initiative about smoking in public places

F. DURIER - CETIAT
http://www.
http://www.

The British Government has opted for a self-regulatory approach of passive smoking in some public places, encouraging licensees of pubs, bars, restaurants, hotels and other styles of hospitality venues to improve the provision of facilities for non-smokers and the availability of clean air.

An industry-led initiative supported by the government, called the "Public Places Charter on Smoking", was launched in 1999. In March 2000, formal targets were agreed between the hospitality industry representatives and the Department of Health: 50 % of pubs should have a formal smoking policy and carry an external policy sign, 35 % of these policies should restrict smoking to designated areas and/or have ventilation that meet the agreed standard (provide $30 m^3$/person/hr of fresh outside air, with additional ventilation and/or filtration to get a comfortable environment for staff and customers).

The "AIR Initiative" website gives information and guidance about the way to fulfil the objectives of the Charter. It includes details about the ventilation requirements and the systems that can be used.

The ACMA (Air Cleaner Manufacturers' Association) was set up to prove the effectiveness of its members' equipment regarding the "Public Places Charter". This led to the development of a test methodology with BSRIA (The Building Research and Information Association), an industry code of practice and the launch of BSRIA's certified rating scheme to show the real performance of air cleaners. BSRIA's website provides information about this performance certification scheme.

NEWS FROM PRACTICE

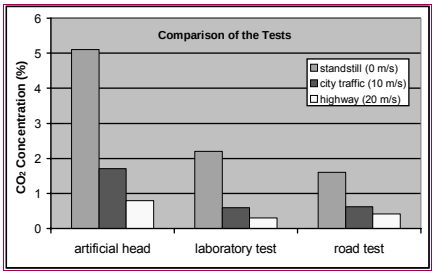
Physiological and ergonomic characteristics of motorcycle helmets concerning the CO_2-problem

M. CAMENZIND - EMPA
http://www.

The integral helmets currently available on the market generally offer good protection in accidents. But negative physiological and ergonomic characteristics of the helmet such as bad ventilation, insufficient heat and moisture exchange, high CO_2-concentration inside the helmet, as well as a reduced viewing angle could impair the concentration and the ability to react and lead to a substantially increased risk of accidents.

The heatable and sweating artificial manikin head ALEX was used for the evaluation of the thermal insulation and the efficiency of the ventilation openings. Combined with a wind tunnel installed in a climate-controlled chamber, realistic riding conditions were simulated. The CO_2 concentration within the facial area was measured by means of another artificial head, which was equipped with a Draeger lung attached to a gas-cylinder supplying an appropriate concentration of CO_2 to mimic the effects of human exhalation. Human subject tests within the climate-controlled chamber, as well as similar measurements on the road were carried out to check the manikin-based methods.

The measurements of these three methods showed comparable results. The parameters used for the manikin test were based on rough estimations and will be adapted according to the absolute values measured.
The CO_2 concentration in some of the fairly air-tight helmets grew to peak values over 2 % under unfavourable conditions. An increased risk of accidents due to CO_2-exposure, especially at low riding velocities, is strongly suggested by these results. Considering the heat retention problems also apparent at higher ambient temperatures, efficient helmet ventilation is clearly sub-optimal in some cases.



Results from the different methods for a typical helmet

From the test results accumulated thus far, weak points of existing helmet constructions could be identified. Based on these results it should be possible to systematically and efficiently examine ameliorated helmets, and to derive general guidelines for the construction of helmets with improved physiological characteristics.

INFO FROM PROJECTS

Full-scale wind pressures on a permeable roof of a low-rise building

B. PARMENTIER - BBRI
http://www.

In order to make a design of the roof elements (and their fixings) the actual effects of the wind must be known. The wind effects can be determined according to different national standards but these will be replaced by Eurocode 1 in the coming years.

In Eurocode 1 (EC1) the determination of the pressures on a roof of a low-rise building is obtained by using the pressure coefficients (CP) associated with the building shape, the peak velocity pressure … and the permeability of the different skins for roofs with more than one skin. These factors are included in the equation (Eq.1).

$$\Delta W = (CP_e - CP_i).q_p(z_e) \qquad (1)$$

The European standard proposes to use a value of Cp_i (in the thin air layer just under the permeable roof elements) depending on the nature of the external pressure:

$$CP_i = 2/3.CP_e \ if \ CP_e < 0 \qquad (2)$$

$$CP_i = 1.3.CP_e \ if \ CP_e > 0 \qquad (3)$$

Despite the fact that full-scale measurements are used more and more worldwide to validate theory or to compare with model-scale tests an important lack of knowledge exists concerning the values of CP_i.

A test house was erected on the site of BBRI in Limelette in order to control the validity of the assumptions given above concerning the values of the pressure coefficients. It was built on a rotary base to allow the study different angles of attack of the wind (A.O.A.) whatever its direction. A meteorological mast with 2 anemometers (5,2 m and 12 m height) is positioned 30m upstream of the building to minimize the effect of the flow distortion associated with the house.

The results of the measurements are presented on the AIVC-CD.

Test house on the site of BBRI (Limelette - Belgium)

Ventilation and Indoor Air Quality in Schools

H. GRAVES - BRE

The responsibility for ventilation in new schools in England and Wales has recently passed from the Department of Education and Skills to the Building Regulations Division of the Office of the Deputy Prime Minister. In order to assess the performance of the current stock of new school buildings, BRE was asked to monitor ventilation and indoor air quality in a representative sample of primary schools.

BRE has developed a monitoring protocol, which has been trialed in two primary schools to test its effectiveness and the impact on the school (which was kept to a minimum). The protocol measures ventilation rates by two methods. The first method uses a non-toxic per-fluorocarbon tracer gas technique. Sources are placed around the classroom under test and the gas concentration is detected within the classroom. The concentration of gas at any given time changes inversely in proportion to the ventilation rate. The second method relies on monitoring the level of carbon dioxide within the classroom. The ventilation rate can be deduced by making some assumptions about the metabolic rate of the occupants.

A large range of organic compounds was monitored in the protocol, namely, formaldehyde acetaldehyde, acrolein and 16 volatile organic compounds. The major sources of these compounds are likely to be decoration and furnishings and cleaning materials. Carbon monoxide, nitrogen dioxide and particulate levels were measured, which are likely to derive from combustion sources including traffic.

Lastly, a range of microbiological samples was taken including dust mites from carpets and bacteria and fungal samples. Sources of the bacteria and fungi could be within the school or be brought in from outside (either from home or from the schools grounds, e.g. from rotting vegetation).

There were no serious air quality problems in the two schools examined in the pilot study but the sample is far too small to make any conclusions at this stage.

The main monitoring study has begun this school year and will continue into the next school year. Eight schools will be studied, each for one week. The schools are a representative sample of new school buildings in terms of size and geographic spread urban, suburban and rural. In schools where a "stuffy" classroom has been identified, this room and another, which is thought to be acceptable for ventilation, are monitored. Where possible, the two classrooms will be physically separated within the school, will have different age group occupants, and may have different floor coverings (i.e. carpet versus vinyl flooring). In this way, the sixteen classrooms (20 including the pilot study) will have as wide a spread of properties as can be achieved in a relatively small sample. These data will give a clear view of the range of ventilation rates and indoor air quality that is prevalent in our new school building stock today. The project will be completed by March 2004.

For further details about this project, please contact Hilary Graves, BRE Environment: *Gravesh@*

Comparison of European Energy Performance regulations

J.-Ch. VISIER - CSTB
http://www.

The Energy Performance (EP) standardisation and legislation is in many member states considered to be an attractive tool for increasing the energy efficiency of new buildings and existing buildings. Several countries already have an Energy Performance Regulation (EPR) in place and/or are preparing a new regulation.

The ENPER-TEBUC project realized in the frame of the SAVE programme of the European Commission,
DG TREN, studies the possibilities for designing harmonised building codes at the European level. It involves partners from 15 countries on the topic of energy performance standardization and regulation. In addition, 6 other European countries are associated on a voluntary basis.

Therefore the existing European building regulations are compared, extending existing work in that field. Since within the time horizon of the Kyoto protocol (2008 – 2012), the existing building stock will be responsible of most of the energy consumption and CO2-emissions, possible measures to foster energy efficiency in this field are particularly scrutinised. On this basis general principles for a model building code for use in new buildings and - where applicable - renovation are developed. Furthermore the questions of checking the application of the code and of building certification schemes are investigated, so that this code can serve as a reliable and visible tool for ensuring building energy efficiency.

Whereas a whole range of European standards are prepared and/or adopted that cover several sub domains of an EP standard, there are major differences in the overall approach used in the different countries for determining the EP level of a building. Setting up a platform for information exchange among the prominent national players, to systematically collect and summarise the different approaches and to develop suggestions for a European "model code" is therefore a main goal of this project.

An important new element in these developments is the new European Directive on the Energy Performance of buildings (published 4 January 2003). This directive imposes the member states to develop calculation procedures according to a number of requirements and to set minimum standards for energy performance. This project provides basic information contained within the objectives of the directive.

The ENPER-TEBUC project has started in April 2001 and will end in September 2003. The first report produced is available on the CD.

This report presents a comparison of the methodology applied in 21 countries for the calculation of energy performance in buildings within national regulations. It also questions the reasons for the differences and similarities between procedures and the convergence of the different approaches.

The first part of the report is an overview of EP calculation regulations and highlights the main differences and similarities in the approach of different countries.

The second part is a detailed analysis of:

1) global philosophy of the energy performance procedure
2) transmission
3) ventilation

4) internal and solar gains
5) summer comfort
6) lighting
7) heating and cooling
8) renewable energies

In addition to the description and comparison of national approaches the report raises questions on the future of European energy performance regulation of buildings.
The ENPER TEBUC project is managed by BBRI. The realization of this report was managed by CSTB.
One point analysed in the report: the number of countries dealing with important parameters in the calculation method of their energy performance regulation.

Ventilation	**15**
Air flow rate	15
Heat recovery	10
Infiltration	10
Flow control	8
Fan Power	5
Duct tightness	3
Heating	**7**
Heat generation type	6
Distribution network insulation	6
Heat generator efficiency and location	5
Distribution temperature and lay out	5
Emitter with and without room control	5
Boiler sizing	4
Storage tank	4
Control of heat generator, heat distribution, pumps, emitter	3
Fan power of emittors	2
Lighting	**5**
Lighting control	5
Daylight	4
Efficient lamps	5
Efficient ballast	3

Study of residential ventilation with heat recovery in Norway

P. G. SCHILD - Byggforsk
http://www.

The number of Norwegian dwellings with balanced heat recovery ventilation (HRV) has doubled every 3 years since the mid 1970's. Balanced ventilation is installed now in half of all new detached houses. The Norwegian Building Research Institute (NBI) has just completed a detailed two-year research project on the quality of these ventilation systems. The study involved both a national questionnaire survey and thorough laboratory tests of 10 HRVs on the market. The overall conclusion is that balanced ventilation with heat recovery provides very good air quality, and has a payback time of 4~6 years for the most profitable systems despite Norway's cheap hydropower (0.09 €/kWh).

Laboratory tests of residential HRV units

Today's European standard for HRV performance testing (EN 308:1997) presently has numerous deficiencies. In particular it does not explicitly define *net* recovery efficiency, i.e. how to account for system losses such as fan energy, air leakage, defrosting, etc., when calculating *net* annual energy savings or *net* air exchange rate. Furthermore, the specified test conditions are neither entirely realistic, nor fair for different HRV types. This situation gives manufacturers an opportunity to make very misleading claims about the performance of their products, such as "*98 % annual heat recovery efficiency!*", which damages the industry's respectability, and prevents consistent and fair comparison between products, which is confusing for buyers. NBI has therefore developed an accurate and fair laboratory test & calculation procedure for rating HRVs, including true annual heat recovery efficiency. The best units achieve just over 70 % annual efficiency in Norway's climate.

Questionnaire survey of homes with balanced ventilation

IAQ: Of 250 homeowners who replied, 90 % are happy with the air quality and the functionality of their balanced ventilation system; this is better than for homes with mechanical exhaust ventilation. Nonetheless, there is still room for improvement, with regard to the quality of the equipment and the workmanship. The study provides circumstantial evidence that HRV systems can be designed with a lower air change rate than today's practice of at least 0.5 ach (mechanical) in addition to infiltration. It also shows that HRVs with moisture recovery are beneficial to IAQ in very cold climates where the indoor air can become very dry.

Energy: Collected energy consumption data shows a clear link between net heat recovery efficiency and a dwelling's annual energy consumption, and is consistent with calculations using EN 832. Dwellings with highly efficient heat recovery (e.g. reciprocating regenerators) use on average 10~15 % less energy than those with traditional cross-flow plate heat exchangers, and apparently 20~25 % less than those with air/air heat pump HRVs.

Ducts: 28 % *of* dwellings reported reacting to some ventilation noise in bedrooms; 2 % said that the noise was very uncomfortable — the number of people who react to noise can nevertheless be reduced by simple improvements to duct system design and installation. The survey confirmed that galvanized steel round ducts provide better air quality, and are quieter, than flexible ducts. Since most homeowners are diligent with filter renewal, supply ducts seem reasonably protected against dust accumulation. However the data arguably indicates a very slight trend of degradation of air quality over time, so duct systems should be easy to inspect and clean economically.

Reliability: There was a very significant difference in the reliability of different makes of HRV. The most reliable makes are more reliable than typical mechanical exhaust systems, whilst the least reliable systems are considerably worse. On average there is a 6.8 % probability of experiencing a technical problem in any one year.

STANDARDS AND REGULATIONS

Revised version of European version of European Standard EN 779 about air filters

F. DURIER - CETIAT

A revised version of the European Standard EN 779: *"Particulate air filters for general ventilation. Determination of the filtration performance"* has been very recently published.

It defines a classification of filters according to their average filtration efficiency with liquid DEHS particles of 0.4 µm diameter. Class F filters (F5 to F9) have a filtration efficiency with these particles between 40 and 95 %. Below 40 %, class G filters (G1 to G4) are classified according to their arrestance efficiency with a synthetic dust.

The revised standard provides more knowledge about the performance of air filters than the previous version of EN 779 (dated 1993) as it introduces a filter's fractional particle efficiency. Filters are tested against two synthetic aerosols, one fine for measuring filtration efficiency as a function of particle size (range from 0.2 µm à 3.0 µm) and one coarse for obtaining information about dust loading capacity, and in the case of coarse filters, the filtration efficiency with respect to coarse loading dust.

Addenda to ASHRAE ventilation standard

F. DURIER - CETIAT
http://www.

ANSI/ASHRAE Standard 62-2001, **Ventilation for Acceptable Indoor Air Quality**, sets minimum ventilation rates and other requirements **for commercial and institutional buildings**.

Addenda *x, y* and *aa* were approved for public review at Ashrae's 2003 Winter Meeting held in Chicago in January 2003.
Minimum separation distance requirements between common outdoor contaminant sources, such as exhaust vents and loading docks, and outdoor air intakes are specified in addendum *aa*. It also sets requirements intended to limit rain intrusion and entr ainment and for bird screening.

It was approved for a second public review.
Approved for a fifth public review were addenda *x* and *y.* Addenda *x* revises the humidity control requirements of the standard, as well as clarifies the standard's existing recommendations and requirements to assure that the building envelope does not contribute to indoor air quality problems. Addendum 62*y* classifies air with respect to contaminant and odour intensity and limits the recirculation of lower quality air into spaces that contain air of higher quality.

All public review dates will be announced on Ashrae website. Electronic draft versions of the addenda can be found on the Website during the comment period.

Four addenda to ANSI/ASHRAE Standard 62-2001 (addenda, *r, z, ad* and *af*) were also approved for publication.
Addendum 62*af* changes the purpose and scope of the standard to describe how it relates to new and existing buildings, clarifies its coverage of industrial and laboratory spaces, and adds a caveat concerning situations where outdoor air quality may be poor.

The addendum states that the standard is intended for regulatory application to new buildings, additions to existing buildings, and those changes to existing buildings that are identified in the body of the standard. It also states that the standard is intended to be used to guide the improvement of indoor air quality in existing buildings.
Addendum *r* contains requirements for assessing the quality of outdoor air used for ventilation. It requires outdoor air quality assessment and particle filtration when the outdoor particle concentration is high. It does not require air cleaning for other gaseous contaminants.

Addendum *z* addresses air cleaning requirements for ozone. The standard currently recommends outdoor air cleaning for contaminants of concern but does not require cleaning for outdoor contaminants including ozone.
Addendum *ad* updates material in Appendix C of the current standard, which contains a number of air quality guidelines and regulations issued by bodies other than Ashrae. In addition, the addendum describes the source of the values and the context in which they were developed. The addendum also deletes Appendix A (Conversion Factors) and places the relevant material at the end of this appendix.
Published addenda to Ashrae standards are available for free at the Ashrae website.

Finally, Ashrae will move forward with publication of an addendum 62*o* to the ANSI/ASHRAE 62-1 Standard that will make the standard's ventilation requirements apply only to non-smoking spaces and provide new design guidance for controlling odour in indoor spaces where smoking occurs.

The design guidance in addendum 62*o* addresses the use of ventilation to control odours from tobacco smoke but does not address health effects. It was approved for publication in June 2002 but six appeals were filed later. Ashrae denied the appeals at its 2003 Winter Meeting in January 2003.

Addendum 62*o* deletes smoking lounges from a table on outdoor air requirements for ventilation. In the same table, the requirements in spaces where smoking is assumed to occur have been lowered, and a footnote is added explaining that the table applies to no smoking areas.

In addition, the addendum addresses ventilation in smoking areas by requiring these areas to have more ventilation and air cleaning than comparable non-smoking areas.

Addendum 62*o* also provides a method to allow designers to determine the additional ventilation over what would be provided in a similar non-smoking area for the purpose of odour control only.

Typically, the increase in ventilation is about 10 to 40 cfm/person (0.3 to 1.1 m^3/person/hr) over the non-smoking rate in spaces without heavy smoking. The actual increase will depend on the smoking rate and occupancy density of the specific space.

The guidance is provided as information only in an appendix that accompanies the standard and is not required for compliance.

ASHRAE Standard 62.2P

M. SHERMAN - LBL
http://www.

The 4th public review ASHRAE Standard 62.2P (Ventilation and Acceptable Indoor Air Quality in Low-rise Residential Buildings) closed on 23 December;

ASHRAE received 28 comments from 7 "commentors" generated from the small number of independent substantive changes in the public review. Reviewing the public review comments and developing responses to them was the primary activity of the committee (SPC 62.2P) at the January ASHRAE meeting in Chicago.

The committee and its subcommittees worked with the "commentors" and their comments most of whom attended the meeting or were represented and voted official responses to all the comments. The comments generally consisted of two types. Some comments were on long-standing issues on which the "commentors" and the committee (or ASHRAE) fundamentally disagree such as whether source control is appropriate or not within the context of a residential ventilation standard. These issues were discussed, as they are at most meetings, but as all reasonable compromises were reached, there was little change.

Many of the requirements in 62.2P serve to limit contaminant emission rather than to increase ventilation in order to provide acceptable indoor air quality. The committee is convinced that venting of cookers, clothes dryers and bathrooms is needed. The committee is also convinced that sometimes it is necessary to check combustion appliances (such as water heaters) to see that they vent properly (i.e. do not backdraft).

This approach is in keeping with ASHRAE's position on IAQ, from which the following can be drawn:

* ASHRAE standards should consider health impacts when setting the criteria for acceptable indoor environments.
* ASHRAE will continue to improve standard 62 and promote its broad acceptance and implementation as a major factor in IAQ management.
* Pollutant source control measures are often the most effective means of preventing IAQ problems.
* For many contaminants (including CO) eliminating or isolating the source is the preferred method of control.
  (The entire text can be found in the position papers section of *http://www.* .)

Another example of this schism on source control involves whether Carbon Monoxide (CO) alarms have a place in the standard. The SPC was persuaded by presentations made by the Gas Industry and others that current CO alarm products were not reliable enough for use in 62.2 and rejected "commentors" request to put CO alarms in the standard. Although standards existed that produced products that were considered reliable, no products were then made that met those standards. The SPC did agree to reconsider the issue should sufficiently reliable products become available.

Since 62.2 is a ventilation and indoor air quality standard, but not a life-safety standard, the value of a CO alarm must be demonstrated as an appropriate source control technique. The fact that a CO alarm may (or may not) save lives in a fire is not relevant to 62.2P. If it can, for example, serve in place of a backdraft testing or additional ventilation in garages, it could be relevant.

The second class of comments received indicated that the "commentors" misinterpreted the intent of the language in the draft. These comments pointed out that the committee's language could be improved for clarity and the committee approved several such editorial changes. Sometimes these changes resolved "commentors" concerns, but sometimes they did not.

One example of such misinterpretation involved the requirements regarding testing and certification of air flows and sound ratings for air moving equipment. Some "commentors" believed that the standard required that all air moving equipment to tested using specific standards of the Home Ventilating Institute (HVI) and be third-party certified. Although 62.2P did list certain HVI (and other) standards as being appropriate for use, it allowed the user to select an appropriate standard. Similarly 62.2P did not address who certifies the rating, thereby allowing self-certification. The committee made editorial changes to this section to improve its clarity.

The committee made other editorial changes to the draft in response to comments, but it did not find any need to make substantive changes to the document. Therefore, the committee does not anticipate the need for another public review.

The committee is currently undertaking its formal responses to "commentors" and coordination of appropriate paperwork. Assuming that this process goes accordingly to schedule and there are no unforeseen events, a vote for publication is likely at the ASHRAE Annual meeting this June.

BOOKSHOP

New AIVC Annotated Bibliography

Review of Airflow Measurement Techniques

See page 1 for more information.

Construction Technology Updates

http://

Construction Technology Updates are practical 4-6 page publications for architects, engineers, specification writers, property managers, builders and building officials.

They are authored by the Institute for Research in Construction (IRC) on behalf of the National Research Council of Canada (NRC).

48 titles published between 1997 and 2000 (over 200 pages of building science principles and research results) are now available for free on the Internet.

8 titles dealing with ventilation are also available on the AIVC-CD:

- No.3 Maintaining Acceptable Air Quality in Office Buildings through Ventilation
- No.5 Window Condensation in Historic Buildings that Have Been Adapted for New Uses
- No.14 Why Houses Need Mechanical Ventilation Systems
- No.15 Current Approaches for Mechanical Ventilation of Houses
- No.33 Factors Affecting the Performance of Ventilation in Large Buildings
- No.37 Influence of Air Diffuser Layout on the Ventilation of Workstations
- No.47 Basic Principles of Smoke Management for Atriums
- No.48 Considerations in the Design of Smoke Management Systems for Atriums

Duct fitting database from ASHRAE

F. DURIER - CETIAT
http://www.

This database has been published by ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) in 2002 for the first time on a CD. It includes loss coefficient tables for more than 200 round, rectangular, and flat oval duct fittings. For any given fitting, the user may enter the flow rate and fitting information and obtain loss coefficient data and associated pressure loss. The CD includes table data for supply, exhaust, and common (supply/return) duct functions, and is fully printable. Fittings may be saved into a project file. An "Explorer" view gives the user an integrated graphic view of all fittings and headings.

MEETINGS AND EVENTS

FAN NOISE 2003

F. DURIER - CETIAT
http://www.

The Second International Symposium FAN NOISE 2003 will be held in Senlis, France from 23 to 25 September 2003.

Important progress has been made in understanding, predicting and reducing fan noise by improvements in design and installation together with the extended use of control devices. Nevertheless, fans continue to present problems concerning noise emission and this is exacerbated by their ever-widening applications both industrially and domestically.

The symposium, organised by CETIM and CETIAT, will concern all types of fans. It will cover topics such as fan noise generation mechanisms, experimental methods for noise source location, theoretical and numerical methods for the prediction of unsteady flow and aerodynamic noise of fans, fan installation effects, fan noise and sound quality, optimisation of thermal and acoustic performance of complex systems with fans, noise control by passive & active methods, measurement of airborne, induct and structure-borne fan noise, selection and design of low-noise fans.

The First International Symposium on FAN NOISE was held in
September 1992 in Senlis with more than 250 participants from 20 countries.

The Outcome of the Conference *Sustainable Building 2002*

J. BRUNSELL - Byggforsk

General
The international conference held in Oslo, Norway 23-25 September 2002, gathered about 1050 delegates from more than 60 countries from all continents.

Program
During the three-day conference about 450 papers were presented either as an oral presentation or as a poster presentation.

The program covered most areas regarding sustainable building. From single building products in a life cycle perspective, to whole buildings and buildings gathered into larger settlements and cities. Also the infrastructure and social aspects were covered in the presentations.

Life cycle assessment of buildings was an important theme at the Sustainable Building 2002 as at previous Sustainable Building conferences. In addition to such assessment methods, there were also sessions on the design process, the building process, facility management and energy services with several case studies. Barriers and processes with recycling, reduction on environmental load from various products, and tools and systems for choosing sustainable materials are other examples from the program. Creating sustainable cities, urban development, infrastructure and decision-making processes were another important themes. Last but not least, the business opportunities regarding sustainable buildings were focused these were split into policies, investment strategies and competitive advantages of building sustainability.

Only a few papers addressed indoor air quality since these aspects are covered well in other conference series. But energy efficient ventilation was one aspect that of course was included as a possibility to reduce the energy demand especially in commercial buildings.

Outcome of the conference & conclusions
It was clearly shown that progress in sustainable building, especially in those countries with a large existing building stock, is only incremental. This will not be enough to meet Kyoto targets, to avoid severe problems in resource availability, in water supply, and social cohesion in urban settlements. New revolutionary concepts, radical change in the management of our resource cycles, and initiatives for providing shelter are needed.

It was concluded that in addition to preventing climate change, the building sector will have to anticipate the effects of climate change.

Furthermore there is still a strong emphasis on design and construction of new buildings. However the existing building stock and rehabilitation of neighbourhoods should be the main starting point for the sustainable building and housing strategies.

The analysis of GBC projects indicates that the use of Renewable energy is growing in the housing sector, but it lags behind in office buildings.

Proceedings
All papers are presented in CD-ROM proceedings and short summaries are presented in a Summary book. These can be purchased for 300 NOK. Please contact *synnove.brekke@*

Next Sustainable Building conference
The next conference in the Sustainable Building series will be held in Tokyo, Japan in the autumn of 2005.

Ventilation, Humidity Control and Energy AIVC BETEC 2003

The 24th Conference of the Air Infiltration and Ventilation Centre
Washington USA
12 to 14 October 2003
http://www.aivc.org

Purpose
Enhancing indoor environmental quality, reducing moisture problems, and conserving energy are all increasing in

importance. Mould, house dust mites and other microbiological organisms may cause health problems. Ventilation is a critical factor in the control of humidity levels in buildings. Because ventilation air is often heated or cooled, energy is a significant and unavoidable issue. The overall scope of the conference includes indoor environment in all buildings, with a particular focus on residential buildings. This conference will highlight results from research and practices from around the world.

Organising committee
The conference is jointly organised by:
International Network for Information on Ventilation (INIVE EEIG) on behalf of the Air Infiltration and Ventilation Centre (AIVC)
Building Environment and Thermal Envelope Council (BETEC)
of the National Institute for Buildings Sciences (NIBS)

Location
AIVC BETEC 2003 will be held at
Hamilton Crowne Plaza Hotel
1001 14th Street NW
Washington, DC 20005
United States of America

A contingent of rooms is being reserved for conference participants and accompanying persons at the **Hamilton Crowne Plaza Hotel** and a special group rate will be offered. The Hamilton Crowne Plaza Hotel is conveniently located just a few blocks from the White House, and close to shops and restaurants, with easy access to other hotels in the metropolitan area.

Dates
The Conference will start on Sunday evening October 12, 2003 with a welcome reception and will end on Tuesday evening October 14, 2003.

Registration fees

	Before July 1st 2003	From July 1st 2003
Full participants	$475	$575
Students	$275	$375

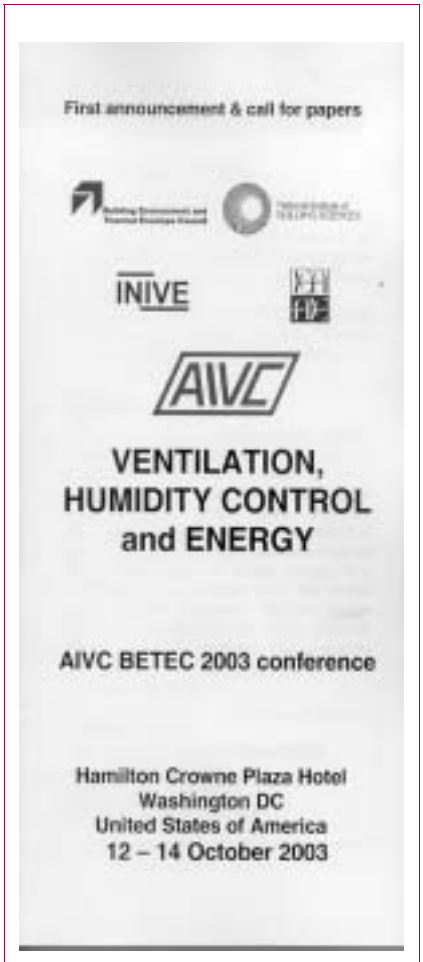
One full registration fee by participant is required for each technical paper included in the programme. Papers submitted without payment of the registration fee will not be inserted in the Conference proceedings nor included in the technical programme.

The fees cover:
- Attendance at all oral sessions and all poster sessions;
- Breakfast, lunches and breaks throughout the conference;
- Light meals and drinks during the Sunday reception and Monday poster session;
- The proceedings.

Topics of the conference
- The following topics are selected for the conference. Authors should indicate the topic(s) to which their abstract/paper is related.
- Quality of outdoor air.
- Energy efficient ventilation strategies.
- Standards and codes for ventilation and energy.
- Latent energy costs of ventilation.
- Ventilation in hot humid climates.
- Humidity control in cold and severe climates.
- Indoor conditions and microbiological growth.
- Innovative demand controlled systems.
- Building envelope and moisture.
- Air tightness effects of building and ductwork.
- Maintenance and cleanability of ventilation systems.
- Dehumidification strategies and effects.
- Low-cost low-energy ventilation.
- Simplified measurement techniques.
- Effects of humidity levels on comfort and health.
- Inhabitants' use of ventilation systems.
- Air quality and humidity sensors.

Conference secretariats
INIVE EEIG
Boulevard Poincaré 79
BE-1060 Brussels, Belgium
Tel. +32.2.655.77.72
Fax +32.2.653.07.29
E-mail: *conferences.inive@bbri.be*
Contact: Stéphane Degauquier

NIBS
1090 Vermont Avenue, NW - Suite 700
Washington DC 20005-4905, USA
Tel. +1.202.289.7800
Fax : +1.202.289.1092
E-mail: *pcichowski@nibs.org*
Contact: Patricia Cichowski



Strategies for clean air and health

2nd AirNET annual conference / NERAM international colloquium
http://www.
http://airnet.

November 5 - 7, 2003
Santo Spirito Hospital
Rome, Italy

The objective of the Colloquium is to examine health effective policy options for air quality management in North America and Europe based on currently available scientific information on:
1. Exposure and Health Effects
2. Air Quality Modeling
3. Strategies for Risk Management and Risk Reduction

This joint meeting of the NERAM International Colloquium Series and the AIRNET European Thematic Network on Air Pollution and Health will address the following key questions:

- What risk reduction strategies are available and upon what information are they based?
- What does health effects research tell us about the risks from air pollution, including who should be protected, and from what sources or components of the air pollution mixture?
- What sources contribute to risks to public health, and what methods are available to link sources to exposures? How can air quality modelling inform local, regional and continent wide air management strategies?
- What are currently the most prominent research priorities to improve air quality management and is the science community targeting these priorities?

Call for Abstracts - April 7, 2003
Abstracts are invited for posters and keynote papers addressing evaluation of health risks; air quality modelling; analysis of risk management inputs and options; or evidence-based proposals for clean air strategies where the emphasis is on the implications of science for clean air policy development and implementation.
To submit an abstract and for more information:
http://www. or
http://airnet.

Forthcoming conferences

Details for the forthcoming conferences are available on the CD.

POLICY AND PROGRAMMES

European Energy performance Directive approved

(continued from page 1)

Article 1: Objective
The objective of this Directive is to promote the improvement of the energy performance of buildings within the Community, taking into account outdoor climatic and local conditions, as well as indoor climate requirements and cost-effectiveness.
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 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 more than 15 years old.

Article 2: Definitions
For the purpose of this Directive, the following definitions shall apply:
1. *"building":* a roofed construction having walls, for which energy is used to condition the indoor climate; a building may refer to the building as a whole or parts thereof that have been designed or altered to be used separately;
2. *"energy performance of a building":* the amount of energy actually consumed or estimated to meet the different needs associated with a standardised use of the building, which may include, *inter alia*, heating, hot water heating, cooling, ventilation and lighting. This amount shall be reflected in one or more numeric indicators which have been calculated, taking into account insulation, technical and installation characteristics, design and positioning in relation to climatic aspects, solar exposure and influence of neighbouring structures, own-energy generation and other factors, including indoor climate, that influence the energy demand;
3. *"energy performance certificate of a building":* a certificate recognised by the Member State or a legal person designated by it, which includes the energy performance of a building calculated according to a methodology based on the general framework set out in the Annex;
4. *"CHP"* (combined heat and power): the simultaneous conversion of primary fuels into mechanical or electrical and thermal energy, meeting certain quality criteria of energy efficiency;
5. *"air-conditioning system":* a combination of all components required to provide a form of air treatment in which temperature is controlled or can be lowered, possibly in combination with the control of ventilation, humidity and air cleanliness;
6. *"boiler"*: the combined boiler body and burner-unit designed to transmit to water the heat released from combustion;
7. *"effective rated output* (expressed in kW)": the maximum calorific output specified and guaranteed by the manufacturer as being deliverable during continuous operation while complying with the useful efficiency indicated by the manufacturer;
8. *"heat pump":* a device or installation that extracts heat at low temperature from air, water or earth and supplies the heat to the building.

Article 3: Adoption of a methodology
Member States shall apply a methodology, at national or regional level, of calculation of the energy performance of buildings on the basis of the general framework set out in the Annex. Parts 1 and 2 of this framework shall be adapted to technical progress in accordance with the procedure referred to in Article 14(2), taking into account standards or norms applied in Member State legislation.
This methodology shall be set at national or regional level.
The energy performance of a building shall be expressed in a transparent manner and may include a CO_2 emission indicator.

Article 4: Setting of energy performance requirements
1. Member States shall take the necessary measures to ensure that minimum energy performance requirements for buildings are set, based on the methodology referred to in Article 3. When setting requirements, Member States may differentiate between new and existing buildings and different categories of buildings. These requirements shall take account of general indoor climate conditions, in order to avoid possible negative effects such as inadequate ventilation, as well as local conditions and the designated function and the age of the building. These requirements shall be reviewed at regular intervals which should not be longer than five years and, if necessary, updated in order to reflect technical progress in the building sector.

In this article, particular attention is given to indoor climate conditions with as an example "to avoid possible negative effects such as inadequate ventilation".

2. The energy performance requirements shall be applied in accordance with Articles 5 and 6.

3. Member States may decide not to set or apply the requirements referred to in paragraph 1 for the following categories of buildings:
   - buildings and monuments officially protected as part of a designated environment or because of their special architectural or historic merit, where compliance with the requirements would unacceptably alter their character or appearance,
   - buildings used as places of worship and for religious activities,
   - temporary buildings with a planned time of use of two years or less, industrial sites, workshops and non-residential agricultural buildings with low energy demand and non-residential agricultural buildings which are in use by a sector covered by a national sectoral agreement on energy performance,
   - residential buildings which are intended to be used less than four months of the year,
   - stand-alone buildings with a total useful floor area of less than 50 m².

Article 5: New buildings
Member States shall take the necessary measures to ensure that new buildings meet the minimum energy performance requirements referred to in Article 4.

This article is very clear: energy performance requirements must be imposed for all buildings (see definition of building in §2) whereby the calculation method must meet the requirements as given in the annex .

For new buildings with a total useful floor area over 1 000 m2, Member States shall ensure that the technical, environmental and economic feasibility of alternative systems such as:
- decentralised energy supply systems based on renewable energy,
- CHP,
- district or block heating or cooling, if available,
- heat pumps, under certain conditions,

is considered and is taken into account before construction starts.

Article 6: Existing buildings
Member States shall take the necessary measures to ensure that when buildings with a total useful floor area over 1 000 m² undergo major renovation, their energy performance is upgraded in order to meet minimum requirements in so far as this is technically, functionally and economically feasible.
Member States shall derive these minimum energy performance requirements on the basis of the energy performance requirements set for buildings in accordance with Article 4. The requirements may be set either for the renovated building as a whole or for the renovated systems or components when these are part of a renovation to be carried out within a limited time period, with the abovementioned objective of improving the overall energy performance of the building.

Article 7: Energy performance certificate
1. Member States shall ensure that, when buildings are constructed, sold or rented out, an energy performance certificate is made available to the owner or by the owner to the prospective buyer or tenant, as the case might be. The validity of the certificate shall not exceed 10 years.

A certificate will be obligatory for all buildings when constructed, sold or rented. As described in the annex, indoor climate and ventilation related parameters have to be included. Ideally, such certificates should also correctly assess innovative technologies such as demand controlled ventilation, hybrid ventilation, …

Certification for apartments or units designed for separate use in blocks may be based:
- on a common certification of the whole building for blocks with a common heating system, or
- on the assessment of another representative apartment in the same block.

Member States may exclude the categories referred to in Article 4(3) from the application of this paragraph.

2. The energy performance certificate for buildings shall include reference values such as current legal standards and benchmarks in order to make it possible for consumers to compare and assess the energy performance of the building.

The certificate must include reference values and this probably means also information on ventilation related aspects.

The certificate shall be accompanied by recommendations for the cost-effective improvement of the energy performance.

Recommendations concerning ventilation can be part of the certificate.

The objective of the certificates shall be limited to the provision of information and any effects of these certificates in terms of legal proceedings or otherwise shall be decided in accordance with national rules.

3. Member States shall take measures to ensure that for buildings with a total useful floor area over 1 000 m² occupied by public authorities and by institutions providing public services to a large number of persons and therefore frequently visited by these persons an energy certificate, not older than 10 years, is placed in a prominent place clearly visible to the public.

The range of recommended and current indoor temperatures and, when appropriate, other relevant climatic factors may also be clearly displayed.

Article 8: Inspection of boilers
With regard to reducing energy consumption and limiting carbon dioxide emissions, Member States shall either:
a. lay down the necessary measures to establish a regular inspection of boilers fired by non-renewable liquid or solid fuel of an effective rated output of 20 kW to 100 kW. Such inspection may also be applied to boilers using other fuels.
   Boilers of an effective rated output of more than 100 kW shall be inspected at least every two years. For gas boilers, this period may be extended to four years.
   For heating installations with boilers of an effective rated output of more than 20 kW which are older than 15 years, Member States shall lay down the necessary measures to establish a one-off inspection of the whole heating installation.
   On the basis of this inspection, which shall include an assessment of the boiler efficiency and the boiler sizing compared to the heating requirements of the building, the ex-

perts shall provide advice to the users on the replacement of the boilers, other modifications to the heating system and on alternative solutions; or

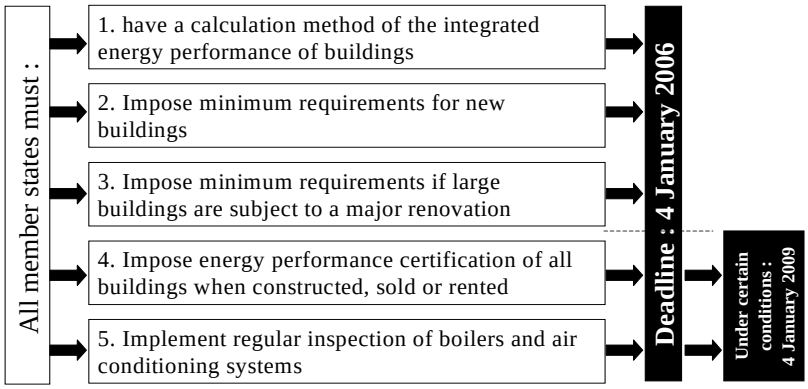
b. take steps to ensure the provision of advice to the users on the replacement of boilers, other modifications to the heating system and on alternative solutions which may include inspections to assess the efficiency and appropriate size of the boiler. The overall impact of this approach should be broadly equivalent to that arising from the provisions set out in (a). Member States that choose this option shall submit a report on the equivalence of their approach to the Commission every two years.

Article 9: Inspection of air-conditioning systems
With regard to reducing energy consumption and limiting carbon dioxide emissions, Member States shall lay down the necessary measures to establish a regular inspection of airconditioning systems of an effective rated output of more than 12 kW.
This inspection shall include an assessment of the air-conditioning efficiency and the sizing compared to the cooling requirements of the building. Appropriate advice shall be provided to the users on possible improvement or replacement of the air-conditioning system and on alternative solutions.

Advice concerning improvement or replacement of air conditioning is required as well as on alternative solutions. This might include information on e.g. passive cooling when applying night ventilation concepts.

Article 10: Independent experts
Member States shall ensure that the certification of buildings, the drafting of the accompanying recommendations and the inspection of boilers and air-conditioning systems are carried out in an independent manner by qualified and/or accredited experts, whether operating as sole traders or employed by public or private enterprise bodies.

Each member state must take the necessary measures to guarantee the required number of qualified and/or accredited experts (including their specifications). This requires very substantial resources. As an example :
for Germany alone, one has to deliver in the 1st year more than 2 million certificates.



Article 11: Review
The Commission, assisted by the Committee established by Article 14, shall evaluate this Directive in the light of experience gained during its application, and, if necessary, make proposals with respect to, inter alia:
a. possible complementary measures referring to the renovations in buildings with a total useful floor area less than 1.000 m²
b. general incentives for further energy efficiency measures in buildings.

Article 12: Information
Member States may take the necessary measures to inform the users of buildings as to the different methods and practices that serve to enhance energy performance. Upon Member States' request, the Commission shall assist Member States in staging the information campaigns concerned, which may be dealt with in Community programmes.

Article 13: Adaptation of the framework
Points 1 and 2 of the Annex shall be reviewed at regular intervals, which shall not be shorter than two years.
Any amendments necessary in order to adapt points 1 and 2 of the Annex to technical progress shall be adopted in accordance with the procedure referred to in Article 14(2).

Article 14: Committee
1. The Commission shall be assisted by a Committee.
2. Where reference is made to this paragraph, Articles 5 and 7 of Decision 1999/468/EC shall apply, having regard to the provisions of Article 8 thereof. The period laid down in Article 5(6) of Decision 1999/468/EC shall be set at three months.
3. The Committee shall adopt its Rules of Procedure.

Article 15: Transposition
1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive at the latest on 4 January 2006. They shall forthwith inform the Commission thereof. When Member States adopt these measures, they shall contain a reference to this Directive or shall be accompanied by such reference on the occasion of their official publication. Member States shall determine how such reference is to be made.

2. Member States may, because of lack of qualified and/or accredited experts, have an additional period of three years to apply fully the provisions of Articles 7, 8 and 9. When making use of this option, Member States shall notify the Commission, providing the appropriate justification together with a time schedule with respect to the further implementation of this Directive.

Article 16: Entry into force
This Directive shall enter into force on the day of its publication in the Official Journal of the European Communities.

Article 17: Addressees
This Directive is addressed to the Member States.

Done at Brussels, 16 December 2002.
For the European Parliament
The President
P. COX
For the Council
The President
M. FISCHER BOEL

ANNEX
General framework for the calculation of energy performance of buildings (Article 3)

1. The methodology of calculation of energy performances of buildings shall include at least the following aspects:
   a. thermal characteristics of the building (shell and internal partitions, etc.). These characteristics may also include air-tightness;
   b. heating installation and hot water supply, including their insulation characteristics;
   c. air-conditioning installation;
   d. ventilation;
   e. built-in lighting installation (mainly the non-residential sector);
   f. position and orientation of buildings, including outdoor climate;
   g. passive solar systems and solar protection;
   h. natural ventilation;
   i. indoor climatic conditions, including the designed indoor climate.

Ventilation and IAQ related aspects are very dominant in the specifications of the calculation method : "air-tightness", "ventilation", "natural ventilation", "indoor climate conditions", …

2. The positive influence of the following aspects shall, where relevant in this calculation, be taken into account:
   a. active solar systems and other heating and electricity systems based on renewable energy sources;
   b. electricity produced by CHP;
   c. district or block heating and cooling systems;
   d. natural lighting.

3. For the purpose of this calculation buildings should be adequately classified into categories such as:
   a. single-family houses of different types;
   b. apartment blocks;
   c. offices;
   d. education buildings;
   e. hospitals;
   f. hotels and restaurants;
   g. sports facilities;
   h. wholesale and retail trade services buildings;
   i. other types of energy-consuming buildings.

Conclusions
Without any doubt, this new directive may in a very substantial way influence the European legal measures in terms of energy efficiency and indoor climate of buildings. The EPD is not only applicable for the present EU members but also for the 10 new associated states. Moreover, it probably will indirectly influence the regulatory measures in other countries.
As illustrated in this article, ventilation and IAQ related aspects receive particular attention.

Implementation Advisory Group established

D. STRONG - BRE
http://www.

The EU Energy Performance of Buildings Directive (EPD) was published in the European Journal on 4 January 2003. The Directive has far-reaching implications for the owners, operators and developers of buildings in the UK. There are also major issues to be resolved regarding the large number of independent experts needed to meet the EPD's building certification and plant inspection requirements.

Key provisions of the Directive are:

- minimum requirements for the energy performance of all new buildings
- minimum requirements for the energy performance of large existing buildings subject to major renovation
- energy certification of all buildings (with frequently visited buildings providing public services being required to prominently display the energy certificate)
- regular mandatory inspection of boilers and air conditioning systems in buildings.

To help the Government implement the Directive, a high-level working group has been established by key professional bodies and trade associations, with seventeen organisations forming the Directive Implementation Advisory Group (DIAG).

Following the inaugural meeting, Professor David Strong, Managing Director of BRE's Energy Division and DIAG's acting Chairman, said "The EPD provides a major opportunity to achieve the step-change in buildings-related energy efficiency called for in the PIU Energy Review. However, practical implementation of the Directive will be very demanding and a pressing need exists to start the essential preparatory work as quickly as possible".

The Directive provides a significant and realistic opportunity to substantially reduce energy use in buildings, which accounts for nearly 50% of all UK CO_2 emissions. Major issues remain to be resolved – including those associated with building labelling, certification and plant inspection – with important implications in terms of research, development, demonstration and training. DIAG is seeking early engagement with the relevant Government department to ensure that the Directive is successfully transposed into law within the three year deadline set by the European Parliament and Council.

AIR + AIVC CD

The Air Information Review (AIR) is a quarterly newsletter containing topical and informative articles on air infiltration and ventilation research and application. The newsletter is distributed with the AIVC-CD.

This set contains the printed version of the Air Information Review and a CD-Rom with :

- Current Air Information Review (with annex documents)
- Related newsletters;
- Airbase (AIVC bibliographical database);
- AIVC publications;
- AIVC conference proceedings.

The set is available through subscription. Subscriptions are for 4 consecutive issues of AIR (from September issue to June issue). See selling prices on the order form.

Enquirers in INIVE countries (Belgium, France, Greece, Norway) can obtain AIR and the AIVC-CD at preferential rates (even free of charge in some countries). Please contact INIVE for practical information (*inive@bbri.be*).

Note: The CD Rom has been developed for use in a Microsoft Windows 95 or 98 environment. There is no guarantee that they will work with other operating systems.

AIRBASE

The full version of AIRBASE, the bibliographical database of AIVC, is available on the AIVC CD Rom. It contains almost 15,000 references and abstracts of articles and publications related to energy efficient ventilation.
New additions to AIRBASE include references of 88 selected papers from the recent “EPIC 2002 AIVC” Conference (Lyon, France - October 2002), as well as references of selected papers from recent “Indoor Air 2002” and “RoomVent 2002” Conferences.

Conference proceedings - CD

A CD-Rom with the proceedings of the last AIVC conferences is available. At present the CD contains the proceedings of AIVC conferences 1998, 1999, 2000 and 2001. Proceedings of 2002 conference will be included in a near future. See selling prices on the order form.

AIVC publications – CD

A CD-Rom with all the guides (5), annotated bibliographies (11) and technical notes (45 – some old superseded ones are missing) published by the AIVC between 1979 and 2002 is available. See selling prices on the order form.

The free publication of the month

One of the AIVC publications is available for free on the Internet (*http://www.aivc.org*). The publication is available for 1 month and afterwards replaced by another one.

Printed version of old technical notes

Since June 2001, the new publications of the AIVC are no longer produced in printed version. However remaining printed copies of previous AIVC documents are still for sale at ECBCS Bookshop (£ 15 + postage).

An overview of the remaining stock is available at *http://www.aivc.org/Publications/clearance.html* (mainly: Technical notes 39 to 51; Guide to energy efficiency ventilation; Improving ductwork: a time for tighter air distribution systems; Annotated Bibliographies 5 to 10, Conference proceedings 1995 to 2000).

Send orders by e-mail at *essu@ecbcs.org* (for printed AIVC publications only), or by fax at +44(0)121.262.1994, marked for the attention of Janet Blacknell.

Mailing Address:
ECBCS Bookshop (ESSU)
C/o FaberMaunsell Ltd
Beaufort House
94-96 Newhall Street
Birmingham B3 1PB
United Kingdom

THE AIVC SPONSOR

RENSON
INNOVATION IN VENTILATION

Renson
Innovation in ventilation
I.Z. Flanders Field
BE-8790 Waregem
Belgium
Tel: +32.56.62.71.11
Fax: +32.56.60.28.51
e-mail: *info@renson.be*
website: *http://www.renson.be*

- ORDER FORM -

Valid until June 2003

Please complete and return this form to INIVE EEIG – Operating Agent AIVC
*by fax to **+32 2 653 07 29** or by mail to Boulevard Poincaré 79, BE-1060 Brussels, Belgium*
On receipt of your order we will forward an invoice, and the order will be dispatched on receipt of payment.

Mr ❑ Mrs ❑ Name .....

Organisation / Firm .....

Address .....

Town ..... Postcode .....

Country ..... E-mail .....

Telephone ..... Telefax .....

VAT .....

Selling prices for AIVC countries (Belgium, France, Greece, Norway, The Netherlands, USA)				
Item **		**Qty**	**Unit Price***	**Total**
Proceedings of AIVC conferences 1998, 1999, 2000 and 2001 (1 CD-Rom)			75 EUR	
AIVC publications CD-Rom – Edition 2002			100 EUR	
Air Information Review & AIVC-CD (Sept. 2002, Dec. 2002, March 2003 & June 2003 issues)	First subscription		200 EUR	
	Subscription renewal		100 EUR	
			Total	

Selling prices for non AIVC countries				
Item **		**Qty**	**Unit Price***	**Total**
Proceedings of AIVC conferences 1998, 1999, 2000 and 2001 – All on 1 CD-Rom			150 EUR	
AIVC publications CD-Rom – Edition 2002			200 EUR	
Air Information Review & AIVC-CD (Sept. 2002, Dec. 2002, March 2003 & June 2003 issues)	First subscription		400 EUR	
	Subscription renewal		200 EUR	
			Total	

* Excl. VAT 21 %

** CD-Rom has been developed for use in a Microsoft Windows 95 or 98 environment

I hereby forward the amount of ..... EUR

- ❑ by **bank transfer**, payable to INIVE EEIG, bank account Nr 434-8208921-09
  KBC bank, Stationstraat 131, 1930 Zaventem, Belgium - Int. Code KRED BE BB
- ❑ by **certified bank cheque** in EUR to the order of INIVE EEIG
- ❑ by **credit card**:
  - ❑ VISA
  - ❑ Eurocard-Mastercard
  - ❑ American Express

I herewith authorise INIVE EEIG to use my credit card information to charge the total amount due for the order
Credit card number ..... Exp. Date .....
Surname and first name of cardholder .....
Date ..... (Cardholder's) signature .....

Delivery address (if different)
Name ..... Country .....
Address .....
.....
Town ..... Postcode .....

AIVC CONTACTS

Belgium
P. Wouters & Ch. Delmotte
Belgian Building Research Institute
Boulevard Poincaré 79
BE-1060 Brussels—Belgium
Tel: +32.2.655.77.11
Fax: +32.2.653.07.29
e-mail: aivc@bbri.be
website: http://www.bbri.be

France
M-C Lemaire
ADEME,
Département Bâtiment et Collectivités
500 Route des Lucioles
Sophia Antipolis
FR-06560 Valbonne—France
Tel: +33.4.93.95.79.56
Fax: +33.4.93.65.31.96
e-mail: marie-claude.lemaire@ademe.fr
website: http://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
GR-15784 Athens—Greece
Tel: +30.1.727.68.41
Fax: +30.1.729.52.82
e-mail: msantam@cc.uoa.gr
website: http://www.uoa.gr

Netherlands
W. F. de Gids
TNO Building and Construction Research
Division of Building and Systems
PO Box 49
NL-2600 AA Delft—Netherlands
Tel: +31.15.26.95.300
Tel direct: +31.15.269.52.80
Fax: +31.15.269.52.99
e-mail: w.degids@bouw.tno.nl
website: http://www.bouw.tno.nl

Norway
J. T. Brunsell
Norwegian Building Research Institute
Forskningsveien 3b
PO Box 123
Blindern
NO-0314 Oslo—Norway
Tel: +47.22.96.55.00
Fax: +47.22.96.57.25
e-mail: jorn.brunsell@byggforsk.no
website: http://www.byggforsk.no

USA
M. Sherman
Indoor Air Quality Division
Buildings 90
Room 3074
Lawrence Berekeley Laboratory
Berekeley, California
USA-94720—United States of America
Tel: +1.510.486.40.22
Fax: +1.510.486.66.58
e-mail: mhsherman@lbl.gov
website: http://www.lbl.gov

Operating Agent
INIVE eeig
P. Wouters & Ch. Delmotte
Boulevard Poincaré 79
BE-1060 Brussels
Belgium
Tel: +32.2.655.77.11
Fax: +32.2.653.07.29
e-mail: inive@bbri.be
website: http://www.inive.org