AIR

AIR INFORMATION REVIEW

Vol 24, No. 4, September 2003 A quarterly newsletter from the IEA Air Infiltration and Ventilation Centre

Quality of the environment in commercial aircraft - CabinAir

W. De Gids - TNO

http://www.____________

CabinAir is an EC-funded project that is investigating the quality of the environment in commercial aircraft. The study is part of the *Competitive and Sustainable Growth* programme under the Key Action "New Perspectives in Aeronautics" of the 5th European Union Framework programme.

The need for the work arises because of the following:

- Problems of the quality of the air within the cabin are created with the practice by airlines of reducing engine bleed air and increasing recirculated air.
- This is because the use of bleed air causes erosion in fuel efficiency and therefore has an adverse operating cost, and external environmental impact.
- Increasing the proportion of recirculated air affects adversely the air quality within the cabin. Serious and widespread concerns are now being raised regarding:
  - Risk of transmission of infectious disease during flight time (e.g. tuberculosis and tropical disease);
  - Increase in respiratory disease associated with the low humidity's experienced in aircraft cabins;
  - Impact on the well-being of occupants of elevated levels of metabolic carbon dioxide (CO_2), carbon monoxide (CO), particulate pollutants and ozone;
  - Adverse impact on the health and performance of cabin crew.
- This problem will be exacerbated by:
  - Growth of air traffic;
  - Tendency for airlines to seek greater fuel efficiency;
  - Future generation of aircraft engines being less amenable to bleed off-takes.

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

The scientific and technical objectives of the project include:

- To establish the extent of the problem and current air quality in commercial passenger aircraft through 'Measurements in the Sky' of generic aircraft.
- Through these measurements, to produce comprehensive information on the relationship of cabin air quality with the performance of the environmental control systems (ECS), filtration systems, the distribution of air in the cabin, and energy consumption and external environmental impact as it relates to fuel burn.
- To provide innovative designs and technical solutions in the areas of:
  - ECS;
  - Filtration;
  - Cabin air distribution and control.
- To optimise cabin air quality and minimise fuel consumption and external environmental impact.
- To develop and propose pre-Normative European Standards which are technically feasible and economically justifiable.

The aim of the project is to enhance the safety, health and comfort of the cabin environment for passengers and crew.

CabinAir covers the whole commercial passenger fleet – both jets and turbo-props.

To ensure general applicability, the work program operates throughout four generic aircraft types that represent the commercial passenger fleet, namely:

- Small narrow body, single- or two-class, short-range;
- Large narrow body, two- or three-class, short- to medium-range;
- Twin-aisle body, generally three classes, medium- to long-range;
- Twin-aisle twin-deck, generally three classes, long-range.

The project is co-ordinated by BRE and involves 16 partners:

- three major European airlines (BA, SAS, KLM);
- three civil aircraft manufacturers (Airbus, Boeing, Fairchild Dornier);
- a civil aircraft engine manufacturer (Rolls-Royce Deutschland);
- two major aircraft air-conditioning manufacturers – one manufacturing ECS (Honeywell Normalair-Garrett) and the other filtration systems (Pall Aerospace);
- a civil aviation authority involved in certification activities (Civil Aviation Authority);
- an aviation health organisation (RAF Centre for Aviation Medicine);
- five leading-edge environmental technology groups specialising in the provision of safe, healthy and comfortable conditions for people in enclosed environments, and with significant experience in European-standards writing (BRE, CETIAT, NBI, University of Essen, TNO).

The research is organised in five core areas:
Work Package 1:
Measurements in the Sky
Work Package 2:
Environmental Control Systems
Work Package 3: Filtration System
Work Package 4:
Air distribution and control systems
Work Package 5:
Performance Specification and Pre-Normative European Standards

The first stage of the project – Measurements in the Sky – has now been completed. This was carried out on 50 BA, SAS and KLM revenue-earning flights to destinations including Rome, Cairo and Bangkok. The monitoring protocol was developed by the CabinAir Consortium. Measurements focused on the key factors influencing passenger comfort and well-being: humidity, air velocity, temperature and the constituents of the cabin air.

The data will be used to establish, for the first time, a picture of conditions on short-, medium- and long-haul flights in the commercial sector of the airline industry.

While monitoring was taking place, CabinAir also investigated ways of improving the performance of environmental control systems and reducing environmental impacts (eg minimising engine bleed and reusing pressurised air). Now work has started on the development of a draft European Prenormative Standard for passenger aircraft cabin environment.

The CabinAir project will run until next autumn, culminating in a two-day international conference to be held in London in October 2003. If you would like to be kept informed of developments, or wish to register interest in the conference, please call BRE Aviation on **+44 (0)1923 664300**, *cabinair@bre.co.uk* or visit the BRE website.

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.

INFO FROM PROJECTS

New European project on Advanced Concepts for Sustainable Building Retrofit (SUBURET)

P. Wouters -
Belgian Building Research Institute

The building sector is responsible for more than 40% of EU energy consumption. Considerable savings could be achieved by a future-oriented refurbishment of the existing building stock that goes beyond the minimum requirements described by the *Directive on the energy performance of buildings*.

As part of the 6th framework programme, the European Commission has in principle decided to support the SUBURET project and contract negotiations have started.

Scope of SUBURET:
to develop tools and design methods for advanced retrofit, to demonstrate successful retrofit concepts and to perform a technical and social evaluation.

Objective of SUBURET:
to demonstrate the feasibility of retrofit concepts capable of reducing thermal energy needs by a factor of 5 to 10 and environmental impact (CO2 emissions) by a factor of 3 to 5.

Means of SUBURET:

- To use the technology and experience from the most successful low-energy buildings (e.g. passive houses) and adapt these to meet the needs of building refurbishment;
- To optimise the added value of alterations/extensions and evaluate and demonstrate the social and economic impacts of optimised refurbishment;
- To provide refurbishment decision and management tools and knowledge on the successful application of the most promising technologies and concepts in all participating countries.

The SUBURET Team **:**
It includes building research groups and professionals, building industry partners, authorities and large building owners from 8 European countries, including 3 newly associated member countries.

SUBURET is conceived as an **Integrated Project** able to do justice to the complexity of building refurbishment and consider technical, economic and social aspects as well as construction and maintenance. This is a prerequisite for a concerted development towards a sustainable building stock in European countries.

For more information, please contact Mark Zimmermann (*Mark.Zimmermann@empa.ch*), who is the chairman of the SUBURET steering group or René Sigg (*sigg@intep.de*), who is the co-ordinator.

SAVE-ENPER report on assessment of innovative (ventilation) systems available

P. Wouters -
Belgian Building Research Institute
http://www___________

Energy performance regulations (as e.g. required in the framework of the European Energy Performance Directive) are in principle a potential strong stimulus for the use of advanced ventilation systems. As part of the SAVE programme of the European Commission, the ENPER project involves partners from 15 EU countries on the topic of energy performance standardization and regulation. In addition, 6 other European countries are associated on a voluntary basis.

One of the already available reports deals with the issue of assessing innovative systems in the context of energy performance regulations.

The following items are handled in this report:

- A discussion about the challenges for a successful implementation of an Energy Performance Regulation whereby specific attention is paid to those aspects dealing with innovation.
- The interaction between the European Directives and the issue of innovation in the building sector. The Construction Product Directive aims to contribute to agreements at European level in relation to the performance assessment and, as such, important in the framework of a discussion on innovation.

  As far as the future is concerned, the European Directive on Energy Performance is expected to be a very important boundary condition for the future application of Energy Performance regulations and, indirectly, for developing a framework for assessing innovative technologies.
- The availability of a coherent framework is important for stimulating industry to invest in innovative technologies.
- As part of the ENPER-TEBUC project, various enquiries were carried out whereby the major aim was to obtain a reasonable overview of the situation in the countries involved in the project.The results of the enquiries dealing with innovation are discussed.
- The major findings in the IEA project Hybvent on the assessment of innovative systems.

The draft report is available on the website.

Improving air quality in homes using supply air windows

F. Durier - CETIAT
http://www.________________

A British project, led by BRE, aims to demonstrate the use of an innovative low energy ventilation system for homes which will improve air quality and reduce energy use.

The “whole house low-energy passive ventilation system” uses a supply air window – typically a double glazed window with an extra external pane forming an air path – in conjunction with passive stack vents.

The supply air window draws air from the outside via a vent at the bottom of the outer glazing, through the air path to enter the room via a vent at the top of the inner window. Solar gain preheats the ventilation air during the day, and at night a proportion of the heat lost through the inner glazing is recovered in the ventilation air.

The system is made from components that already exist, or that can be readily manufactured, and is easily installed, both in new-build and retrofit applications. “So there are no practical barriers to its implementation,” says Dr Paul Baker of BRE Scotland, who is leading the study.

“The supply air window concept was first tried in Canada and Finland in the 1970s and 1980s, but we have improved the design through a program of testing and computer modelling to optimise the existing window technology," says Dr Baker. "We are installing the system in housing association properties in Norwich, the first time the technique has been applied in Britain – although there are trials of similar systems in Denmark, Ireland and Poland." “We are making several improvements to the original concept,” explains Dr Baker. “For example, we will use low emissivity coatings to reduce U-values and maximise heat reclaim. The window also uses innovative pressure-controlled vents that improve heat reclaim efficiency and offer a more stable ventilation rate."

The results of the demonstration will be compared with those of the European study and with previous applications of other innovative solutions, as well as established technologies.

The project will publish design guides and best practice reports on completion of this work in 2004.

The Inventory of European Research on the Indoor Environment (IERIE)

Under the Long Range Research Initiative of the European Chemical Industry Council (CEFIC), the MRC Institute for Environment and Health is compiling a comprehensive database of indoor environment research being conducted in Europe.

The purpose of this database is to provide an up-to-date source of information that may be used to:

- Provide information on current topics relating to the indoor environment.
- Identify gaps in research in the indoor air environment.
- Identify new advances in the indoor air field.
- Assist in the prioritisation of future research in the indoor air environment
- Identify individuals and groups with expertise in particular aspects in the indoor air environment.

Studies of indoor air environment monitoring, ventilation, exposure assessment, building characteristics, health effects, epidemiology and toxicology are all to be included.

In order to facilitate dissemination and easy access by all interested parties, the database is available via an Internet web site:
http://wads.______________.
A short questionnaire is available for download on the website for researchers to complete.

VENSET

W. De Gids - TNO

VENSET is a ***VEN***tilation ***S***ystems ***E***valuation ***T***ool for dwellings and is the final result of IEA Annex 27 Evaluation and Demonstration of Domestic Ventilation Systems.
The main idea for this Annex was the need to develop tools to better evaluate domestic ventilation systems in dwellings in various situations. Different systems in various climates must handle situations with a large range of residential behaviour. With the use of the most complex models and development of new ones a large number of combined situations enable us to use simplified tools that can be used by practitioners in specific cases.

This paper gives the description of the so called electronic version of the results of IEA Annex 27. Various simplified tools are combines in VENSET. More detailed information and elaborated methods can be found in the Handbook which is part of the VENSET tool. Available on the AIVC-CD

Participating countries in IEA Annex 27 were: Canada, France. Italy, Japan, The Netherlands, Sweden, UK, USA.

For the first time easy and handy tools are elaborated that handle most of the various parameters that have to be taken into account when deciding which ventilation system to be installed in a dwelling.
VENSET can be used for dwellings in climates were heating is needed and is valid during the heating season only.

Target Audience
Decisions on ventilation are made in all countries by standard bodies, policy makers, companies involved in the housing industry, and others. But these decisions have been made without a comprehensive evaluation method. Research in recent years described in the IEA annexes e.g. now makes it possible to formulate such methods to evaluate domestic ventilation systems. The VENSET tool developed can be used both for new and for renovating existing dwellings, and for detecting, analysing and solving problems.

The VENSET tool considers:

- User aspects;
- Thermal comfort ;
- Noise; outdoor noise and system noise;
- Building aspects;
- Indoor air quality; constant emission, CO2, cooking products, tobacco smoking, water vapour as condensation in wet rooms and habitable rooms, dryness feeling, the risk for house dust mites growth expressed as winter high indoor humidity, pressure differences;
- Reliability; flow stability and performance over time;
- Energy; heat needed for the ventilation and electricity for the fan energy;
- Life cycle cost.

VENSET has been developed for three climates: cold, moderate, and mild The tool can be applied on all four main ventilation systems and can also be expanded to other systems by adding one or two extra fans.

The four ventilation systems are:
1. Natural Window Airing (NWA);
2. Passive Stack Ventilation (P S V);
3. Mechanical Exhaust Only (MEO);
4. Mechanical Supply and Exhaust (MSE).

The tool should mainly be used as a mean to rank systems with respect to the consequences of different choices.
On the other hand there are also limitations with the tool. Not all cases are covered and approximations have to be done to the assumptions made.

An example

In order to give a view of how results can look like when the simplified tool is used a specific case is given below. Results for three climates and for all four ventilation systems:

The input for the dwelling, on which the tool is applied:

- A detached 2 storey house (single family house);
- Outdoor noise level dB(A);
- n50 for NWA, PSV and MEO = 6 and for MSE = 3;
- Exhaust flow rate 35 dm^3/s;
- Inlet area for NWA and PSV 70 cm^2/device and for MEO 20 cm^2/device. There is a device in each bedroom and two in the living room;
- Air supply rate for MSE 7 dm^3/s for each inlet. There is a device in each bedroom and two in the living room;
- External wall of brickwork;
- Local fan in the kitchen (kitchen hood);
- Window airing characteristic: Average;
- Technical quality of the ventilation system: Average;
- Maintenance level: Medium.

All the below given data can be manipulated by simply clicking on a button and changing a variable.

Just one example of a more detailed tool is given for energy use.

A very special interactive nomogram with a multi zone model behind the screen.
In the nomogram one can change:

- flow rate;
- heat recovery efficiency (100 % to 0 %);
- air leakage;
- inlet area;
- use of the ventilation provisions;
- ventilation system;
- climate.

An example of the Enervent tool:

Input:
Mechanical exhaust system
Average mechanical extracted flow rate: 30 dm^3/s
Air leakage n50: 4
Air inlets: average (165 cm^2)
Window use: average (0.365 m^2)
Climate: Moderate (2993 dd)

Output:
Energy
Fan: 0.9 GJ primary energy 63 kWh
Cost: $ 10
Heating for ventilation:
13.5 GJ primary energy 542 m^3 gas
Cost: $ 114

Resulting in a Net Present Value calculated with scenarios for energy and inflation over 10 years:

Heating gas: $ 1004
Electricity fan: $ 92
Total cost: $ 1096
13.5 GJ primary energy 542 m^3 gas
Cost: $ 114

Resulting in a Net Present Value calculated with scenarios for energy and inflation over 10 years:

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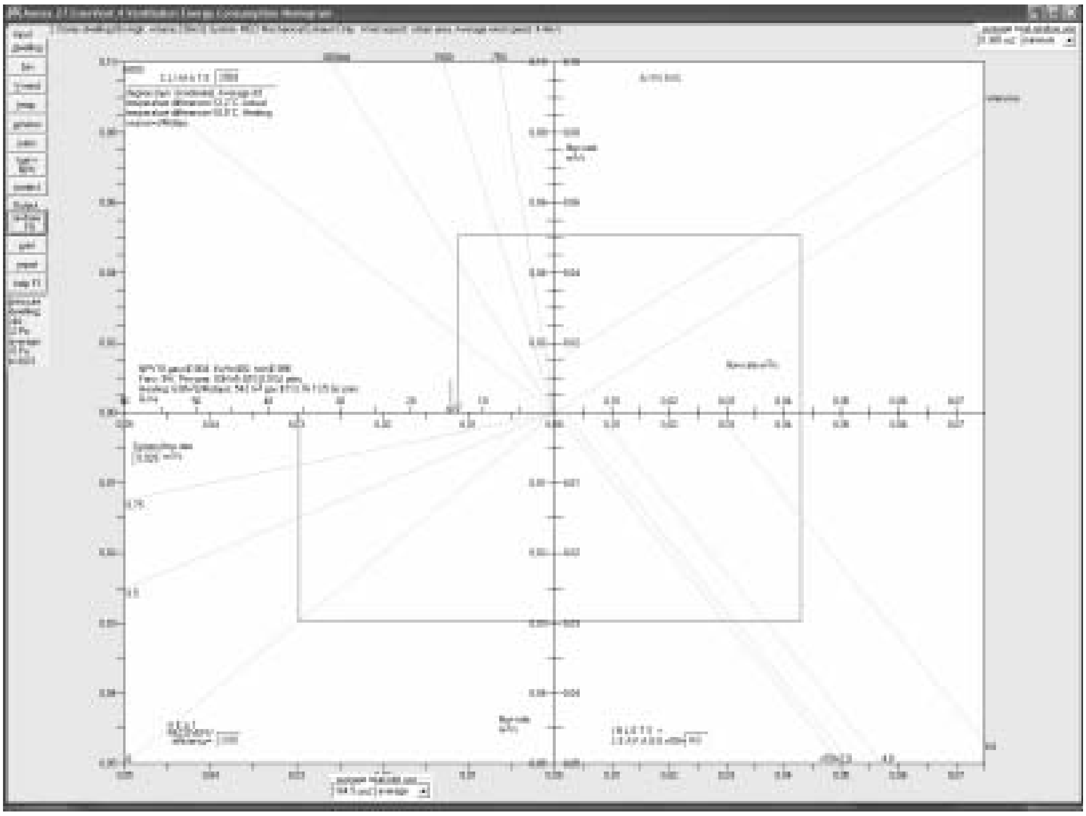

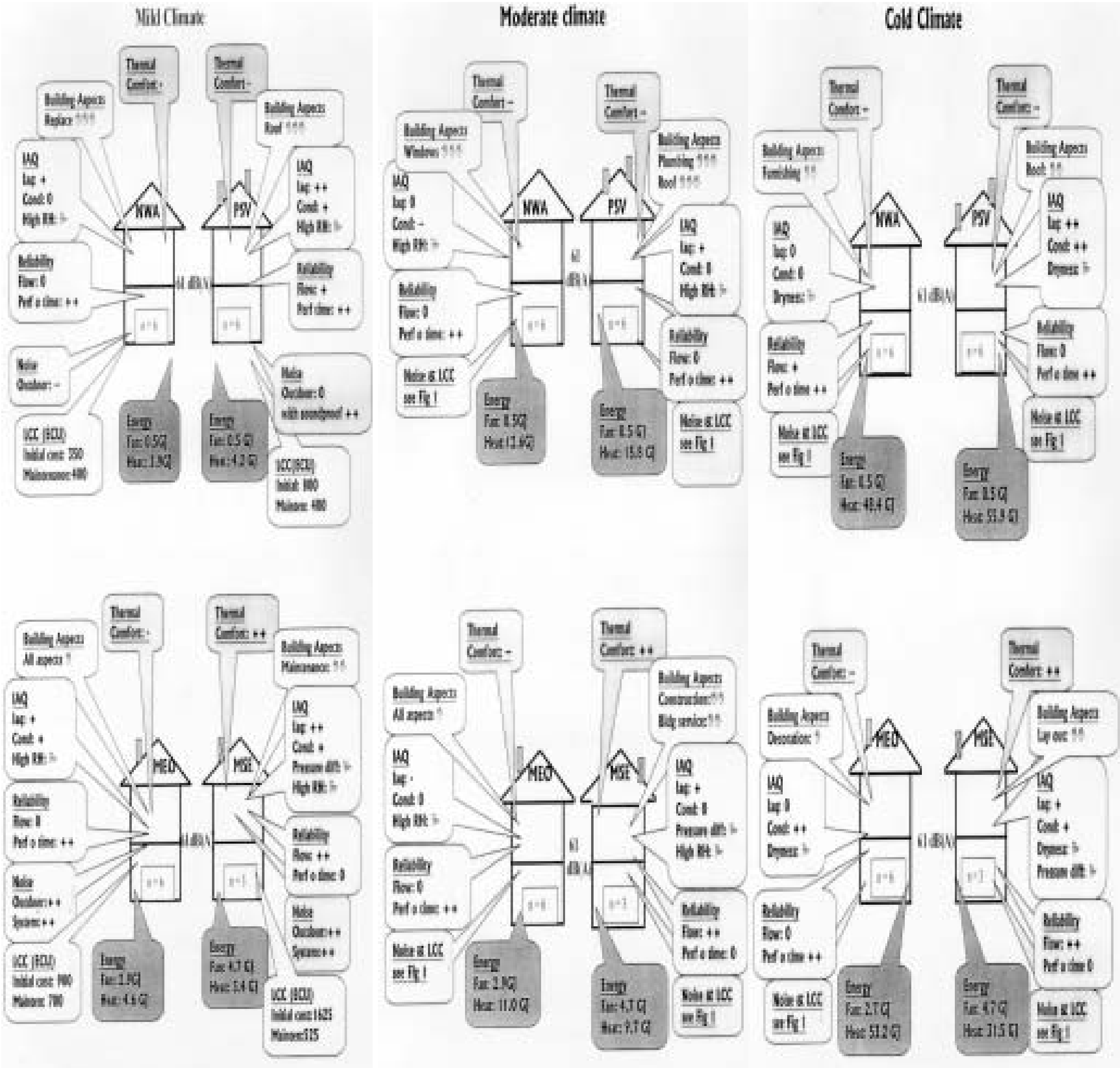
Mild Climate
Moderate climate
Cold Climate
NWA
PSV
MEO
MSE

STANDARDS & REGULATIONS

Unravelling airtightness

http://www.____________

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The 30th of September marks the end of the 'honeymoon period' for compliance with Building Regulations' airtightness requirements by new commercial and public buildings over 1000 m^2.

Since 1 April 2002, when Part L2 of the Building Regulations came into force in the UK, new buildings with excessive air leakage have no longer been acceptable. All new commercial and public buildings over 1000 m^2 must be tested by an accepted testing body for airtightness.

Part L2 now specifies using an air permeability formula that measures the envelope of walls, roof and ground floor area. The new regulations require that air permeability should not exceed 10 $m^3h^{-1}m^{-2}$ at an induced pressure difference of 50 Pascals across the extended envelope.

No more "reasonable compliance"
Until 30 September 2003, the government is prepared to accept a standard of "reasonable compliance". If a building fails its first airtightness test, reasonable compliance can be demonstrated by conforming to one of the following:

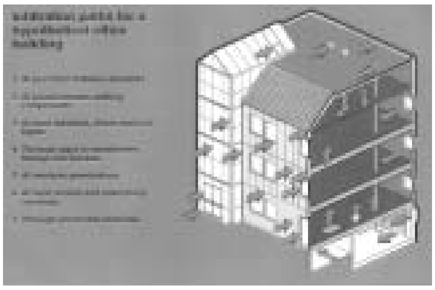
- air permeability on re-testing has improved by 75% of the difference between the first test and the target standard of 10 $m^3h^{-1}m^{-2}$
- air permeability on re-testing is within 15% of 10 $m^3h^{-1}m^{-2}$ (ie less than 11.5 $m^3h^{-1}m^{-2}$).

After 30 September, a building will only comply with regulations if it meets with the standard of 10 $m^3h^{-1}m^{-2}$.

Why bother about air leakage?
Air leakage wastes energy and money. A leaky building loses a lot of heat, so the heating system has to work harder than necessary to keep the building at a comfortable temperature. This results in high heating bills and can be uncomfortable for occupants with draughts and inconsistent temperatures.
For all of us, leaky buildings mean increased emissions of carbon dioxide - the primary contributor to global warming.

Air leakage can be defined as the entrance or escape of air through gaps and cracks in the building fabric. It is driven by wind pressure and temperature differences between the inside and outside of the building, and is therefore is variable and uncontrollable.

Some typical air leakage paths are shown below.



Compliance with Part L2 will minimise air infiltration and leakage resulting in:

- reduced energy costs;
- properly controlled ventilation;
- reduced carbon dioxide emissions;
- smaller plant and plant rooms;
- less degradation of the building fabric;
- reduced risk of condensation;
- improved insulation;
- increased occupant comfort, health and productivity.

What designers and contractors must do
Airtightness should be addressed during the design stage of the building's development, ideally at the concept stage. Air barriers must be:

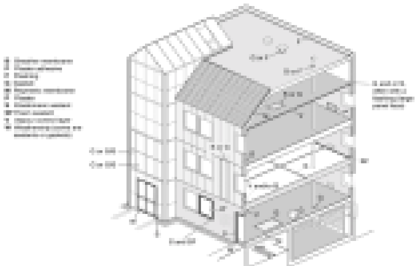
- made up of impermeable material;
- Continuous;
- of sufficient strength;
- long-lasting – they must not dry out or crack;
- able to allow for movements in components;
- able to be applied in areas that are difficult to access;
- accessible for maintenance or replacement.

Designers must decide which surfaces are to form the airtight barrier and which materials to use. The following need to be sealed:

- riser shafts;
- service penetrations;
- hollow concrete beams (at ends);
- window and door frames (to the inside surface);
- underside of metal roofing.

It should be remembered that plant rooms, etc, will be outside the air barrier.

Some methods of sealing are shown below.



The person carrying out the building work, usually the main contractor, is responsible for achieving compliance with Part L2. Once construction has started, contractors should carry out quality checks to make sure that air barriers are being installed properly. A final inspection should take place shortly before the airtightness test.

Testing for airtightness
Airtightness tests should be carried out in accordance with CIBSE Technical Memorandum 23, and the Building Regulations recommend that testing is carried out by a competent body appointed by the main contractor. The method used is 'pressure testing'.

Pressure-testing uses a large fan system to pressurise the building. The system is connected via flexible ducting to a wooden template that is temporarily sealed into an existing doorway. All external doors, windows and trickle ventilators are closed and all the internal doors are wedged open. Mechanical ventilation openings are sealed with polythene sheet and tape or other appropriate materials. Smoke extract fans/vents are closed but not sealed, and other integral openings (eg lift shafts) are left unsealed.

Checks are made during the test to spot and correct any extraneous effects, such as a window or door blowing open, or any temporary sealing failure.

A test can take as little as two hours for a straightforward case, and good preparation by the contractor makes all the difference. More complicated or less well-prepared cases may take up to a full day.

An air leakage audit can also be carried out using small smoke tubes, infrared thermography or large-scale smoke tests (or a combination of the three). It will highlight any potential air leakage paths and enable remedial work to be carried out whilst access is still relatively easy.

It needn't be difficult
Before the new regulations came into effect in April 2002, it was reckoned that more than 50% of buildings would fail to comply with Part L, so there are important implications for everyone involved in the design and construction of buildings. But achieving total compliance with Part L2 is not difficult, as long as the issue of airtightness is borne in mind at all stages of the building process. The essential message is: build tight – ventilate right.

To help contractors get in touch with a competent testing body, an independent organisation called the Air Tightness Testing and Measurement Association (ATTMA) has recently been set up. Members of ATTMA already hold, or are in the process of obtaining, UKAS accreditation for their airtightness testing services.

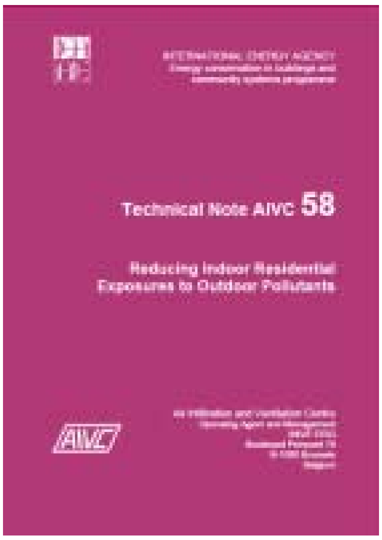
For further information, call Mike Jaggs of BRE on +44.(01)923 664300, *airtightness@bre.co.uk* or visit the website.

BOOKSHOP

New AIVC Technical Note: Reducing Indoor Residential Exposures to Outdoor Pollutants

AIVC Technical Note 58, 2003, 36 pp, M.H. Sherman, N.E. Matson

The basic strategy for providing indoor air quality in residences is to dilute indoor sources with outdoor air. This strategy assumes that the outdoor air does not have pollutants at harmful levels or that the outdoor air is, at least, less polluted than the indoor air. When this is not the case, different strategies need to be employed to ensure adequate air quality in the indoor environment. These strategies include ventilation systems, filtration and other measures. These strategies can be used for several types of outdoor pollution, including smog, particulates and toxic air pollutants. This report reviews the impacts that typical outdoor air pollutants can have on the indoor environment and provides design and operational guidance for mitigating them. Poor quality air cannot be used for diluting indoor contaminants, but more generally it can become an indoor contaminant itself. This paper discusses strategies that use the building as protection against potentially hazardous outdoor pollutants, including widespread pollutants, accidental events, and potential attacks.



HVAC Design Manual for Hospitals and Clinics

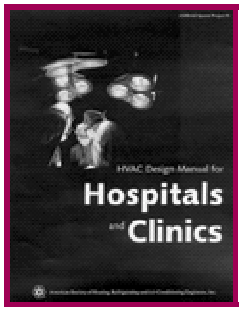
F. Durier - CETIAT
http://www.__________

ASHRAE announced in June 2003 the publication of this new manual.
It provides those involved in the design, installation, and commissioning of HVAC systems for hospitals with a comprehensive reference source for their work.

The text covers environmental comfort, infection control, energy conservation, life safety, and operation and maintenance, providing design strategies known to meet applicable standards and guidelines.

It also contains information on disaster planning and provides "best practice" recommendations on temperature, humidity, air exchange, and pressure requirements for various types of rooms found in hospitals.

A chapter on terminology begins to define several medical terms for the design engineer.

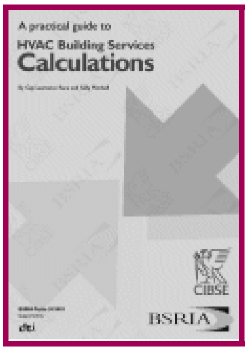


A practical guide to HVAC building services calculations

F. Durier - CETIAT
http://www.____________

BSRIA (United-Kingdom) has published in July 2003 this new Guide, produced in partnership with CIBSE (Chartered Institution of Building Services Engineers).

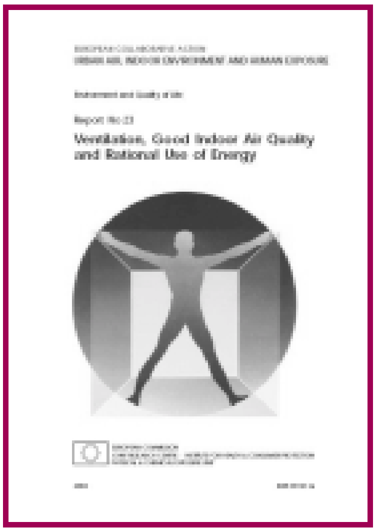
It contains practical methodologies for a range of standard calculations used in the design of HVAC systems. It covers 30 topics relevant to building services design and includes calculation sheets covering heating loads and plant, cooling loads and plant, water flow distribution systems and air flow distribution systems.
The calculation sheets provide practical guidance including design watch points, design tips and rules of thumb, and are intended to aid the design process and reduce errors. The guidance is based on procedures contained within the CIBSE Guides, together with other sources such as British building regulations. The sheets provide guidance on completing the basic calculations needed to define operating conditions for systems, size distribution systems and to specify required duties for plant and equipment.



Ventilation, Good Indoor Air Quality and Rational Use of Energy

ECA has published a new report entitled:
"Ventilation, Good Indoor Air Quality and Rational Use of Energy"

The aim of this report is to provide information and advice to policy and decision makers, researchers, architects, designers, and manufacturers on strategies for achieving a good balance between good indoor air quality (IAQ) and the rational use of energy in buildings, available guidelines and assessment techniques on energy and IAQ, significant trends for the future with implications for IAQ and the use of energy in buildings; and an indication of current research issues.



ECA (European Collaborative Action on, "Urban Air, Indoor Environment and Human Exposure"), 2003
Ventilation, Good Indoor Air Quality and Rational Use of Energy, Report No 23. EUR 20741 EN.
Luxembourg: Office for Official Publications of the European Communities

MEETING AND EVENTS

Forthcoming conferences

Details for the forthcoming conferences are available on the CD.

The 8th IBPSA International Conference and Exhibition on Building Simulation

N. Heijmans -
Belgian Building Research Institute
http://www.____________

The 8th IBPSA International Conference and Exhibition on Building Simulation took place in Eindhoven, Netherlands, on August 11-14, 2003 (*http://www.bs2003.tue.nl*). The conference was attended by about 200 people from 34 countries. The program included 3 key-notes speeches, 3 plenary sessions, 120 oral presentations, 72 poster presentations and about 30 software demonstrations, as well as a permanent software exhibition. The oral presentations were grouped by themes: extensions, integration, validation, software, applications and advances.

Building simulation scope
From the papers, it appears that building simulation is no longer limited to building predesign and design. Its scope is extended to all parts of the building process, including life cycle cost analysis, development of control strategies, commissioning, maintenance and even operation or energy billing.
According to the participants, there is a crucial need for better tools, and especially more integrated tools. The integration should not only include ventilation and thermal aspects, but also energy, light, acoustics, fire safety, cost analysis,… Why not a "universal tool" that would answer any question a designer could have? Of course, this is a dream, but in some extent, it takes shape: several integrated models were presented at the exhibition.
"Better tools" means also tools that deliver results that are more readable by non-specialists. Indeed, simulation tools have proved to be not only effective to design buildings but also to convince customers. Therefore, attention must be paid to the visualization of the results.

Ventilation
Concerning ventilation, some of the topics discussed were: case studies, new tools for airflow predictions, selection of the appropriate simulation tool(s) for airflow prediction, design of passive cooling by night ventilation, using CFD to improve airflow pattern, …

Roles of the architects and consulting engineers
The plenary sessions (which actually were workshops) focused on the role of the consulting engineers and of the architects.
Typically, architects are not familiar with simulation tools. They expect consulting engineers to use them, and to take responsibility for the results of the simulation. This is not a problem, as an architect does not have to be an engineer, but architects should maybe know more about basic building physics and about what simulation can do for them.
The consulting engineers have enlightened the importance of team work. They feel they should be involved earlier in the project, and that they need tools easy to use to make quick simulations at the early stage of the design process, in order to convince architects and clients.

Uncertainties on input data
During the plenary sessions, the "validation" of the input data was considered as important (or even more) than the validation of the models themselves. Unfortunately, this aspect was addressed in a few papers only, and only one focused specifically on that subject. More attention should be paid to uncertainties on input data in the next conference.

Conclusions
Compared to the previous conference, it is apparent that simulations are becoming more popular and widely used. There was a change in the topics discussed in the papers and plenary sessions. The main questions are no longer about practical and technical aspects of the tools and validation of simulation outputs, but about how to use tools to make decisions, to interpret the results in order to improve the design, to enlarge the team working and to convince the client. Therefore, in summary, the discussion is now not “how to make efficient tools?” but “how to use tools efficiently?”

Proceedings
The abstract of the submitted papers are available on this AIVC-CD.
The CD-version of the proceedings has an important added-value: it includes the papers of the seven previous IBPSA Building Simulation Conferences. To purchase the proceedings, contact the secretariat: *bs2003@tue.nl*.

Next Meeting
The 9th Building Simulation Conference and Exhibition will be held in Canada, during the week of August 15, 2005.

Background information
The International Building Performance Simulation Association (IBPSA) was founded in 1986 to advance and promote the science of building performance simulation in order to improve the design, construction, operation and maintenance of new and existing buildings worldwide. More information can be found on *http://www.ibpsa.org/*. The website includes links to the regional affiliates.

Advanced ventilation and integrated energy systems for low energy building retrofit

A summary from the Sustainable Building Retrofit (SUBURET) Workshop
V. Dorer - EMPA

In the frame of the IEA Future Buildings Forum, a workshop was held January 15 –17 2003 in St. Moritz, Switzerland. The goal was to discuss and to decide upon an international collaboration to promote a program for advanced retrofit of existing buildings and community systems.

The following topics were discussed: Advanced insulation technologies, prefabricated insulated roof systems, roof and facade integrated solar systems, advanced ventilation systems, seasonal storage systems, small scale heat pump technologies, integrated energy systems for low energy buildings, criteria for sustainable building retrofit, advanced measuring technologies, risk management in building retrofit, standards and energy performance directives for existing buildings.

To meet the energy targets for buildings on a level according to the Passivhaus standard in new buildings, the ventilation system is a balanced supply/exhaust systems with heat recovery. In a retrofit case, the ventilation system has to be adapted to the various individual constraints like space limitations for ducts or the possibility of using shafts, and constraints in terms of cost.

Various system solutions will be necessary which also meet the high requirements in terms of electric energy use, high heat recovery efficiency, low noise emission and transmission, ease of installation, operation and of maintenance, and low cost.

Major differences in retrofit compared to new buildings in respect to ventilation are:

- Air intake and exhaust at dwelling level in the facade may not be feasible or permissible. Installation of ducts, especially supply ducts, in existing structures is difficult, in many cases impossible. Shafts may exist, which can be used for exhaust ducts.
- At low outside temperatures, there is a narrow band for the permissible outdoor air flow rate: The minimum flow rate is given by IAQ and heat delivery requirements, while the maximum flow rate is limited due to minimum air humidity requirements (room internal humidifiers not considered).
- Room supply and extract transfer devices must be positioned at inner walls with simple ducting placed in the transfer areas (corridor).
- Control strategies and flow control for individual air transfer devices (supply and exhaust) are crucial for easy dimensioning and installation, and for demand controlled and self-adjusting operation.
- Transmission losses may be higher than according the Passivhaus standard. In these cases a simple water based heating circuit may be necessary for an additional radiant warm wall, or for a radiator in the bath room. A room placed stove can deliver significant parts of the space heat demand, depending on heat capacity of the stove and construction, and of the reload schedule.

- For retrofit, in most cases, earth coupling is not an option. This has to be considered both for the heat exchanger construction and performance and, in consequence, for the determination of the heat load.
- Air tightness is a crucial element for efficient functioning of the ventilation system, for the prevention of damage to the building structure, and for the prevention of draught effects. For extract systems, the envelope must be very air-tight in order to avoid too much uncontrolled infiltration. For Passivhaus standard level, the heat from the exhaust air must be recovered (e.g. by heat pump into the domestic hot water storage).

The following possible research topics were identified:

- Standardised ventilation system solution sets for the most common ventilation system types.
- Air distribution components specifically designed and adapted to the needs of retrofit.
- Distribution of heat from air heating and heat from auxiliary heating appliances like room placed stoves.
- Extract systems for retrofit, including development of outdoor air transfer devices with low pressure drop, low draught risk, high sound insulation, no local thermal bridges, and with options for flow control, and optionally also with integrated heating/cooling coil.
- Facade integrated ductwork for air intake and exhaust. Vacuum insulation panels may compensate for insulation space needed for the placement of the ducts in the insulation layer of the façade.
- Easy and reliable measuring and checking methods for flow rates, air tightness, energy and acoustics.
- Integrated multi-purpose units (compact units for ventilation heating and domestic hot water) adapted for in- dwelling installation.

After the workshop, an EU FP6 integrated project proposal "SUBURET" was prepared, which has recently been successfully evaluated by the EU commission.

An extended version of this article is available on the AIVC-CD.

Healthy Buildings 2003 Conference

P. Wouters -
Belgian Building Research Institute
http://www___________

The Healthy Buildings 2003 conference will take place from 7 till 11 December 2003 in Singapore.

The first Healthy Buildings Conference was held in Stockholm one year after the 1987 Indoor Air Conference. Since then the Conference has been held in Oslo, Milan, Budapest, Washington DC and Helsinki. The seventh Healthy Buildings conference will be held in Singapore.

This conference will give particular emphasis on energy-efficient healthy buildings in all climatic conditions.

As such, the aims and scope of this conference are :

- To increase the awareness of healthy indoor environment and energy-efficient building globally, including a special theme for developing countries.
- To create a multi-disciplinary forum on the development and advances made in the field of indoor air quality and climate to achieve healthy, comfortable and productive environments.
- To allow interactions among scientists, policy makers, medical, legal and building professionals on the application of state-of-the-art research to practical problems encountered in the design, construction, operation and retrofitting of buildings.

POLICY & PROGRAMMES

EU FP6-proposal "BRITA in PuBs" positively evaluated by the Commission

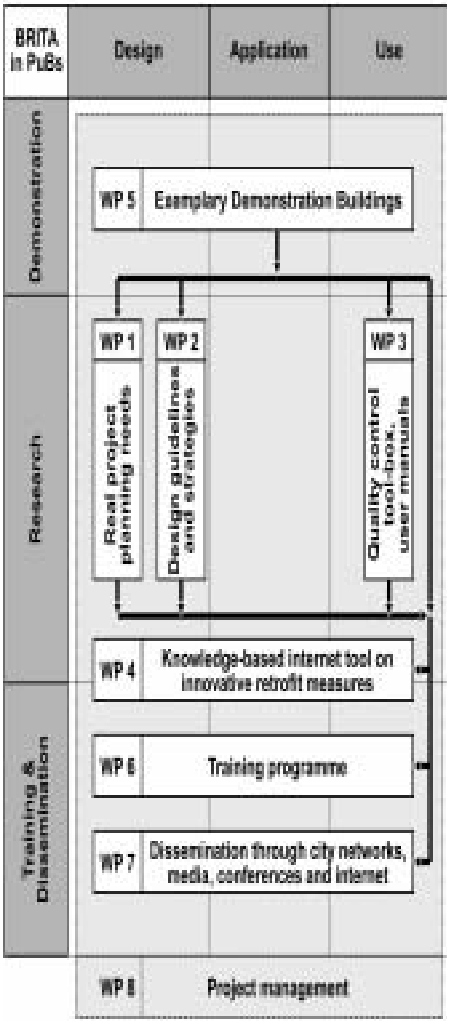
H. Kluttig -
Fraunhofer Institute of Building Physics

In the first call for Eco-Buildings within the 6th Framework Programme an international group consisting of 23 participants from 9 European countries worked out an integrated project (IP) proposal on "Bringing Retrofit Innovation to Application in Public Buildings – BRITA in PuBs". The proposal was positively evaluated according to a letter from the Commission from the beginning of August. Contract negotiations will start in October.

The BRITA in PuBs proposal on Eco-buildings aims to increase the market penetration of innovative and effective retrofit solutions to improve energy efficiency and implement renewables, with moderate additional costs. In the first place, this will be realised by the exemplary retrofit of 9 demonstration public buildings in the four participating European regions (North, Central, South, East). By choosing public buildings of different types such as colleges, cultural centres, nursery homes, student houses, churches etc. for implementing the measures it will be easier to reach groups of differing age and social origin. Public buildings can be used as engines to heighten awareness and sensitise society on energy conservation.

Secondly, the research work packages will include the socio-economic research such as the identification of real project-planning needs and financing strategies, the assessment of design guidelines, the development of an internet-based knowledge tool on retrofit measures and case studies and a quality control-tool box to secure a good long-term performance of the building and the systems. The third main pillar of the BRITA in PuBs project is dissemination. This is divided into a minor part, the training of users and maintenance personnel, and a larger section on publishing the research and demonstration work to different target groups.

Project structure and activities



This will be done in a combination of targeted PR-campaigns and using local, national and international networks such as Energie Cités, the internet and other media, and arrangement and participation in conferences.

The project will be organised geographically by region and vertically by incorporating the owners of the public buildings, the research team of architects and engineers and the project dissemination networks. The project will be managed via biannual meetings, a steering committee and four subtasks on design, implementation, use and dissemination.

The objectives of BRITA in PuBs can be summarized as follows:

- Development of people's consciousness to save energy by exemplary realisations of energy retrofit projects in public buildings (reduction of the primary energy demand > factor 2, decrease of dissatisfaction percentage > factor 2).
- Cutback on reservations against innovative energy saving retrofit concepts in public building administrations by dealing with arguments and solutions methods, reliable information, energy saving potentials and costs. Development of a simple risk analysis method.
- Increase of energy saving potentials by using synergy effects in connection with other technologies (e.g. reduction of the heating water temperature through better insulation).
- Development of short and long-term quality control tool-box and evaluation of integral European harmonised assessment methods (CEN-standards, labelling, EU-directive).
- Development of national and European benchmarking systems including estimation of potentials for innovative, cost-efficient energy retrofit strategies.

The proposal consists of 8 work packages, one on the demonstration buildings, three on the research part, two on dissemination and training, one which could be put in both research and dissemination and the last one on the management of the project. The project structure and the planned activities are presented in the previous figure.

The demonstration projects contain a nursery home, a college, a community centre, a church, a cultural centre, a student hostel, a library, a social and cultural centre and a university building. A wide range of measures will be applied at the demonstration buildings.
Different types of innovative insulation applications, including integrations of solar systems are planned. Advanced aspects like daylight wedges, cavity insulation and double skin facades are planned. All buildings will exchange the windows to higher efficiency; some of them will change it to energy gain systems. Ventilation is the second most important issue. The Hybrid system will substitute classical approaches on natural or mechanical systems. In some of the buildings, reduction of infiltration losses will be a special topic. More than half of the demonstration buildings will change the lighting system to higher efficiency and add daylighting features to reduce electrical energy.

On the supply site a lot of different solutions will be used to ensure a lower primary energy demand. Combined heat and power units, together with absorption chillers for cooling, solar collectors in combination with condensing boilers and other combinations are designed to use energy efficiently and to increase the ratio of renewable energy. Cooling issues are concentrated on passive technologies. Solar chimneys in combination with ground coupled building mass strategies, thermo-active ceilings and intelligent bus technology for controls of sunshading devices as well as daylight components will be implemented. Most of the buildings will apply PV systems by integrating them into the envelope. In that way, synergy aspects will be used to enhance the economic performance. All buildings will use advanced control systems like BEMS planned to extend them to a long-term monitoring system. All of the application will be supervised in the long run by using local energy control systems in the community. The monitoring should also be highlighted to the public by displaying the key values and their trends on a prominent place of the building.

After a successful negotiation with the EU-Commission the project will start in 2004 and will go on for 4 years. The coordinator of the project is Hans Erhorn from the Fraunhofer Institute of Building Physics in Stuttgart, Germany (*hans.erhorn@ibp.fraunhofer.de*).

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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.

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