International Energy Agency
Energy Conservation in Buildings and Community Systems Programme

ECBCS Selects New Chairman

The newly elected ECBCS ExCo Chairman, Dr Morad R. Atif, writes a message of welcome to mark the start of his term of office

The Executive Committee for the IEA Energy Conservation in Building and Community Systems (ECBCS) Program has just published its 2002-2007 Strategic Plan. On behalf of the Committee, I am proud to report on our accomplishments and our new plan. I am equally proud to be part of this group who is committed to research excellence with tangible deliverables, collaboration and teamwork, and technology transfer to national programs and industry. The Committee and the Annex participants have maintained the tradition of excellence in energy R&D, dissemination and outreach, and in collaboration with IEA Building-Related Implementing Agreements (IA's) and other international organizations.

Since 1998, The Committee and Annex participants have completed more than eight major projects - Annexes. These have led to major deliverables including software, design tools, manuals, and demonstration of technologies in key strategic areas: building energy management; the building envelope; ventilation, energy planning for communities, and environmental aspects of buildings. These have reached their targeted audiences via our bookstore and website, and were delivered worldwide as workshops and as technical articles. The ECBCS' Air Infiltration and Ventilation Centre (AIVC) has developed and implemented an outreach and partnership plan to further excel in dissemination in the area of ventilation and air infiltration, though its regular annual conference, newsletter, and timely technical reports. The ECBCS has led efforts to the Future Building Forum, which helped IEA Building-Related IA's develop cohesive and integrated strategic plans to address sustainability, and energy and environmental aspects of buildings. The Committee has successfully maintained close contacts with the EU's R&D Framework, CIB, iiSBE and other international organizations.

Congratulations to all the IEA ECBCS community for a job well done, and special thanks to our partners within and outside the IEA community. I re-

In this issue:

iterate the message of the ECBCS Executive Committee of its special appreciation for the valuable leadership of my colleague and outgoing Chairman, Richard Karney, during his six years of office.

The Committee recognizes that drivers of previous plans are still of relevance today. These include concerns of environmental impacts of fossil fuels, business process to meet environmental targets, and building technologies to reduce energy consumption. New and common challenges have emerged in all the national programs leading us to address climate change, sustainability, indoor health, usability, and innovation. There is still a challenge to develop performance indicators and tools for the impact of building technologies and processes on GHG (greenhouse gas) emissions. Past projects and experiences show that we have to focus projects where energy is part of the whole building performance and a sustainable concept in buildings and communities. This must lead us to focus more on delivering reliable and applied life cycle analysis. The issue of indoor air quality, in the general context of indoor health, has never been more relevant that in the last decade. Energy measures and solutions in buildings at the expense of indoor air health and occupants' satisfaction are not cost effective. Therefore, there is a need to develop effective ventilation and indoor source control tools, and to ensure occupants' acceptance of energy measures and solutions. Recent advances in knowledge and information technology have created a challenge to innovate in key areas of building product development, such as high performance insulation and automation, and in the application of interactive design tools or advanced energy management systems. These challenges and drivers should recognize the growing need for retrofit measures and the impact of IT in the transformation of work and home indoor environments.

During 2002-2007, the mission of the ECBCS is ***"to facilitate and accelerate the introduction of energy conservation, and environmentally sustainable technologies into healthy buildings and community systems, though innovation and research in decision-making, building assemblies and systems, and commercialization".*** The strategies will lead to applications in new and existing residential, commercial, and office buildings, and communities. To be effective, these strategies will have to affect *design and business environment; building technologies and systems, outreach and commercialization*.

Design tools and prediction methods for energy savings in buildings should improve the sustainability and indoor health of buildings, and accommodate user-driven IT trends of work and home environments. Reliable metrics for LCA are essential to advance sustainability and innovation in buildings. With the promising developments in material science come opportunities to develop high-performance materials and assemblies and improve existing ones, for higher durability and thermal performance and minimum environmental impacts. We will exploit advances in IT to develop energy-efficient and integrated environmental control systems, such as HVAC, for cooling, heating and lighting, and also user-driven energy management systems through advances in sensor and wireless technologies, system interface, etc. An important strategy for healthy buildings is to reduce ventilation loads through reliable research in IAQ, mainly the control of contaminants.

Our activities extend to buildings and communities where there is a need to demonstrate and develop systems for integrated power, cooling and heating generation, and distribution systems in buildings and communities, in collaboration with other IA's such as District Heating and Cooling and Demand-Side Management. We will work with the IEA community such as IEA Solar Heating and Cooling to develop collaborative Annexes on low energy concepts and the application of renewable energy sources in buildings to further address sustainability and the climate change agenda. The IEA Buildings Co-ordination Group will make it possible to further address such collaborative projects.

Technology transfer and outreach have been and remain part of the ECBCS mandate. We will continue to excel in delivering outputs and technical reports through our website, bookstore, newsletter, workshops, national contacts, and AIVC. The ECBCS will continue to work with other international organizations and networks. Finally, it is a privilege to report on the Committee's strong commitment to efficient use of resources for healthy and sustainable buildings through the solid values of collaborative processes, excellence in research and development, and outreach.

Morad R. Atif

ECBCS Chairman

Dr Atif is the Director of the Indoor Environment Research Program at the Institute for Research in Construction, part of the National Research Council Canada. His contact details may be found on p15.

Canada's Sustainability in Buildings Programme Revealed

At the ECBCS Technical Day held 12th June 2002 in Ottawa, Canada an overview of Canada's programmes for achieving sustainability in buildings was presented. The presentations covered many aspects of building energy efficiency and sustainability, including energy code experiences, a commercial building incentive program, an investigation of housing affordability, advanced integrated mechanical systems, and updates on the progress of three ongoing ECBCS research annexes, as well as introductions to the Canadian energy situation as a whole, and to the Canadian Centre for Housing Technologies. The present article attempts to give a flavour of the various facets of the meeting.

The following presentations were given:

The Canadian Energy Situation – An Overview, by Graham Campbell, Director General Office of Energy Research and Development, Natural Resources Canada, and CERT

Energy Efficiency in Housing and Buildings in Canada, and the work of the CANMET Energy Technology Centre, by Mark Riley, Building Group, CANMET Energy Technology Centre, Natural Resources Canada

The Panel for Energy Research and Development – Buildings and Communities (2000-2004), by Mark Riley

Canadian Experience with the Energy Code for Buildings, by John Haysom, Canadian Codes Centre, Inst for Research in Construction

The Commercial Building Incentive Program, by Stephen Pope, OAA, MRAIC Commercial Buildings Section, Buildings Group, CANMET Energy Technology Centre, Natural Resources Canada

A Housing Affordability Lens on Energy Conservation for Buildings and Communities, by Jim Robar, Canada Mortgage and Housing Corporation

The Canadian Centre for Housing Technologies, by Mike Swinton, Research Manager

eKOKOMFORT (TM): An Approach to Integrated Residential HVAC, by Robin Sinha and Jamie Glouchkow, CANMET

Advanced Integrated Mechanical Systems (AIMS) – An Overview, by Jamie Glouchkow

Annex 35: "Control Strategies for Hybrid Ventilation in New and Retrofitted Office Buildings", by Per Heiselberg

Annex 40: "Commissioning of Building HVAC Systems for Improving Energy Performance, by Jean-Christophe Visier, CSTB, France

Annex 31: "Energy-related Environmental Impact of Buildings", by Thomas Green, CMHC

A summary of four of the above presentations is provided here.

The Canadian Energy Situation – An Overview, by Graham Campbell

The presentation considered aspects of the Canadian energy situation.

Energy in Canada – Supply and Demand

The importance of energy in Canada is bound up in various factors: it forms 6.2% of GDP, provides 201,000 good jobs, $54 billion in exports, and $20-$30 billion in investment. There is an uneven regional impact.

Policy Challenges – Energy Sector

Elements of the energy framework in Canada's present energy policy include 1) a sustainable development approach which balances economic development, environmental stewardship and social objectives; 2) open-market orientation with efficient, competitive and innovative energy policy; 3) focused interventions – regulation: e.g. consumer access at competitive prices, health and safety of Canadians, energy efficiency, renewable energies, alternative transportation fuels, standards, S&T to encourage innovation, rural, remote and aboriginal communities; 4) Respect for provincial resource ownership, and management within provinces, and 5) A cooperative approach with all stakeholders.

The key challenges identified were a growing concern for the environment, provincial electricity market restructuring, growing demand, continued dependence on fossil fuels, a move to higher cost sources, and energy security.

Energy S&T in Canada

There is a wide variety of Federal energy S&T performers and programs ranging in the level of industry engagement, and based on a spectrum of innovation covering fundamental research, applied research and development, demonstration, and increased market penetration. One of the most important components of S&T is deployment, managed by NRCan in several areas to promote energy efficient technologies and clean energy sources, with programs including:

For Buildings: the R-2000, and the Commercial Building Incentive program

For Industry: the Canadian Industry Program for Energy Conservation

For Transportation: FleetWise and FleetSmart

For Renewable Energy: the Renewable Energy Deployment Initiative, and the Wind Power Production Incentive.

NRCan success stories include RR&D through commercial deployment in buildings programs such as eKOCOMFORT, SolarWall (a renewable energy application to commercial buildings) and HOT2000 and HOT2-XP (modelling tools).

The consultation process is carried forward by stakeholder groups of industry sectors and horizontal organisations, by conferences including regional summits in every province, youth/aboriginal/rural and a national summit, by federal, provincial and territorial meetings and by energy sector engagement.

International Collaboration

The Government of Canada works with international organisations, initiatives and bilateral agreements around the world such as the International Energy Agency, Canada-European Union Agreement on Scientific and Technological Cooperation and Asia-Pacific Cooperation (APEC), the US DOE – NRCan MOU on Energy R&D, and many bilateral agreements to implement Canadian technology around the world.

Energy Efficiency in Housing and Buildings in Canada, and the work of the CANMET Energy Technology Centre, by Mark Riley

This presentation set out to show how Canadian housing is more energy efficient and is in fact the only sector in a realistic position to achieve Kyoto targets. Although commercial building stock still lags in envelope energy efficiency, the new buildings are significantly better. The concept of sustainability is showing a clear influence on construction practices. It is clear that future activities are set to expand the focus on holistic integrated life-cycle issues as well as very targeted technology opportunities.

The CANMET Buildings Group focuses on research, demonstration and deployment of energy efficient building technologies. Its 35-strong staff work on residential and commercial, energy simulation and business communications. Find more details at *http://buildingsgroup.nrcan.gc.ca*.

The CANMET Energy Technology Centre works with partners to develop and commercialise energy technologies, with Canadian companies to help them establish access to and partnerships in the markets of other countries, and with foreign companies to adopt technology to Canadian conditions. It employs around 180 researchers and engineers.

CANMET Energy Technology Centre – Activities

The activities of the Centre fall into three categories: Residential Buildings; Commercial Buildings and Simulation. The following is a list of the main aspects of the work.

Residential Buildings

PERD – including window standards and technologies, IAQ: energy efficiency and health impacts

SuperE(TM)

Advanced Integrated Mechanical Systems (AIMS)

Technical Support – R-2000, EnerGuide, HOT2000, HOT2 XP

Technology Transfer

Commercial Buildings

PERD – including retrofit guidelines, innovative window technologies, and daylighting

C-2000

Green Buildings/iiSBE

Technical Support – CBIP, EE4 (for commercial building energy simulation – *www.ee4.com* for free download), Russia Design Assistance

Technology Transfer

Simulation

HOT2000

HOT2 XP

HOT3000 (ESP-R)

HOT2 EC

Houstrad

BASECALC

Fuel Cells

EE4 Code (DOE2.1E)

EE4 CBIP

Bildtrad

GBTool

GS2000

FRAME PLUS for window energy analysis (download at *www.frameplus.net*)

ATHENA

Systems Approach

The systems approach for energy efficiency in housing includes:

~ Insulation and airtightness, with walls to RSI 5.3 (double stud), attic insulation to RSI 10.6, and airtightness as low as 0.3 ac/h at 50 Pa,

~ Thermal efficiency improvements to space heating and hot water systems, with natural gas appliances from 55% improved to 78-90+%, and water heaters from EF of 0.52 to 0.62+,

~ Mechanical ventilation with heat recovery for fresh conditioned air, and

~ Low-emission interior furnishings and finishes – to improve the indoor air quality.

The Centre's energy efficiency activities include Federal government research (PERD) demonstrations, development, tools, regulations, suasion programs and incentive programs; the Energy Efficiency Act and Model National Energy Code for Houses and Buildings (MNECH); 'Climate Change Action Plan'; Provincial agencies, e.g. incentives to social housing, government owned buildings and utilities, e.g. promotions, preferred rate structures and incentives mainly to commercial clients.

R-2000 Housing's current funding will run till 2006. It specifies energy efficiency and indoor air quality requirements. Around 9,500 houses have been built so far in this program and they are 35% more energy efficient than conventional new homes. The incremental cost is about 3-5% of conventional houses. The SuperE(TM) program is founded on the R-2000 work.

EnerGuide for Houses has been available since 1998 and is funded until 2006. It provides an energy rating for existing houses and energy efficiency recommendations to the homeowner. So far around 42,000 houses have been audited and 20% to 25% energy savings identified, giving 10% and 15% actual savings by owners and $75 to $200 in utility bill savings. Carbon dioxide reductions have averaged 2 t/yr per house.

The Commercial Buildings Incentive Program (CBIP)/C-2000 Buildings is aimed at new and substantially renovated buildings, including multi-family, office, retail, hotel and mix-use buildings. The CBIP hurdle rate is 25% better than the Energy Code and it is performance-based using EE4 simulations. For the C-2000 buildings, the target is 50% better than the Energy Code plus 'green' features.

Other high performance activities include Advanced Healthy Housing, The Canadian Centre for Housing Technologies, C-2000 Buildings/ Green Buildings Challenge/Integrated Design, and Eko-10 (Zero Net Impact) Buildings.

The Commercial Building Incentive Program: Introducing Green Building Performance to the Mass Market, by Stephen Pope,

The CBIP arose from several concerns and investigations, including the Model National Energy Code for Buildings, Performance Path (part 8, which introduces whole building energy simulation as an alternative to prescriptive requirements). It is intended to demonstrate the ease of meeting the MNECB requirements; the targets set are benefiting from experience of a previous high performance building demonstration program (C-2000). The CBIP is designed as a mass market program in contrast to 'hands-on' high performance programs like C-2000.

Technical Requirements for the program – The entry threshold is a 25% improvement on energy consumption level set by MNECB prescriptive requirements, and the incentive level is set at two times the first year energy cost savings to a maximum of $60,000 per submission. The incentive is intended to cover the incremental design cost, but is paid to the building owner. Compliance is demonstrated with the customized version of the energy simulation software designed to support MNECB.

The program was launched with strong advertising presence in the building industry media (print). There is a simplified compliance path for buildings less than 4650 m^2 with prescriptive measure sets and the program account managers tour the country contacting interested clients and designers. Technical staff are made available to assist with skills development in building energy simulation, and third party experts also reference for simulation assistance.

Barriers

Barriers to the program at its start included a political climate opposed to legislation, low energy costs, a conservative commercial buildings culture, very little familiarity with energy simulation within the industry as a whole, and the fact that the structure of MNECB makes achieving the entrance performance level very difficult for some building types. The response to these barriers came in the form of a self-directed training CD covering MNECB, CBIP and energy simulation fundamentals which was developed and distributed. Also training courses developed for simulators and delivered nationally, there was technical support increasing to full simulation in problem cases (limited time), a web based energy benchmarking tool was developed, and a network of energy simulators established to provide extended assistance to new simulators on a peer to peer basis.

Successes

The best performers reinforce the C-2000 conclusions, that greatly improved performance can be achieved at little or no incremental capital cost. The program has expanded the Canadian energy simulation industry, and new tools are making energy simula-

tion more available to the Canadian design community. Accessible energy simulation also increases the designers' ability to consider other green building measures – measures are made available through cost savings from reduced equipment capacity and cost.

The CBIP Designer Survey showed that most higher performing buildings have no incremental cost. The initial survey confirmed by a later 170 building review found that the average cost was +4.5% for an average reduction of 36%. The average incremental cost (<5%) was less than the expected bid variance. Cost neutrality was achieved through building systems trade-offs, and there were incremental C-2k costs for measures beyond energy efficiency.

Limitations

The limitations of the program are that the time required for uptake by the commercial building community is longer than the typical government program duration; also the need for program marketing is continuous and staff requirement for simulation assistance is intensive. The need for professional education is also continuous, and maintenance and upgrades of the software are expensive and the need is perpetual.

The program has been successful in introducing the use of whole building simulation to 'early adopter' consulting practice. The simulation community is growing with access to the new tools, and institutions (largely school boards and now Federal Public Works) are referencing CBIP as a minimum design target. In the next step, a discussion of the next version of the program has commenced.

A Housing Affordability Lens on Energy Conservation for Buildings and Communities, by Jim Robar

CMHC is Canada's national housing agency, with objectives to improve housing choice and affordability, and housing and living conditions. Its technical research priorities are to make housing more affordable by reducing construction, renovation and operating costs, and to advance Healthy Housing (TM) by reducing energy consumption to lessen climate change, protecting occupant health (moisture and indoor environment), using and reusing residential water, and encouraging sustainable community planning and design. Further technical research priorities are to help Canadians protect their housing investment by promoting industry technical competence, and helping consumers themselves protect their investment. Finally, the improvement of building performance is sought by reducing the impact of natural disasters, improving the durability of building envelopes and addressing unique technical and affordability problems of remote housing.

The Healthy Housing strategy includes concerns for occupant health, energy efficiency, resource conservation, environmental impact and affordability. The CMHC's Healthy House in Toronto aims to challenge the industry with sustainable building and community solutions.

Water in Remote Communities

Water in remote areas such as Nunavut, the cost of utilities and water to householders is the highest in the country and the quality and level of consumption for health are both of concern. Wastewater causes environmental damage. The CMHC response is to provide on site wastewater recycling microsystems, thus re-using water and reducing demand and costs. The results of a case study for 39 homes in two communities showed a healthy increase in water consumption of 35%, water and sewage costs reduced by 50%, the elimination of environmental damage, and a three year payback period.

The use of autonomous infrastructure for remote communities has been shown to reduce housing costs by 60% using appropriate design, energy conservation, alternative technologies and sustainable practice.

Sustainable Community Planning

CMHC's goal is to encourage neighbourhood design and land use planning approaches that reduce costs, reduce environmental impacts and maintain community livability. The drivers are efficiency, quality and impact. Solutions are being sought for efficient, viable, livable, healthy and marketable housing by fusing patterns of conventional suburbs and grided cities and by capturing the activity potential of the arterial street. The positive impacts will be 19% more developable land as population density increases comfortably, 30% less pavement, 30% less infrastructure, 8-12% added to permeable surfaces, 8-12% added to green areas, and more room for wildlife.

The challenge is to improve on achievements already attained and to produce excellent quality housing that is affordable to households with very modest incomes.

Environmentally Friendly Buildings and Assessment Methods

By Aleksander Panek[1] and Malgorzata Suchecka[2]
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A paper presented at the IEA Energy Conservation in Buildings and Community Systems Programme Executive Committee Meeting, Technical Day, held in Krakow, November 2001

Introduction

In the past thirty years the scale of environmental problems has shifted upward, from local and temporary to global and chronic. Atmospheric change, land degradation, acid rains, and accelerating species losses are occurring on every continent. Humankind is the major force changing the face of the earth and the only one who has the capacity to control the direction of change. By the coming decade, the majority of humankind will be living in cities, therefore cities will be responsible for environmental depletion. On the other hand, urban designers and planners, architects, and the makers of building materials have a major role to play in enhancing the sustainability of our cities in the 21st century.

This paper describes the features of a model that has been designed through an international collaborative process to meet environmental and sustainable objectives in building assessment. It also describes other assessment methods that have been introduced in different countries all over the world.

The Evolution of the Building Environmental Assessment Method

Buildings are complex products, and different methods of analysing them with respect to their environmental properties and performance have been developed. Many actors with different competence and interest have been involved – manufacturers, designers, developers, researchers, etc. They all have their own goals regarding 'green' buildings. The tools to reach the goals vary from simple checklists to complex criteria systems with different kinds of weighting and almost full life cycle analysis (LCA). There are many different environmental assessment systems on the market operated by consulting agencies. All these systems are based on criteria systems, but the main structure varies, like the number of criteria, the weighting systems and the weights. The results consequently differ greatly. As a result, customers become confused and ask for more core methodology supported by official bodies.

The trend is moving towards more holistic and complex but well structured systems. The standardisation of LCA and the growing availability of environmental data for building materials and fuels are pushing the development towards applying the LCA methodology in the building sector as well. LCA is the scientific method of determining the environmental impact of all kinds of different products, processes and waste scenarios. The method is based on the fact that all the relevant processes use materials and energy and produce emissions and waste. But some special and important issues like the indoor environment, and socio-economic features, have to be tackled separately from the LCA track.

On the other hand, it would be very interesting to develop an assessment system which let us assess the environmental performance of buildings from the financial point of view. However, it will be extremely difficult because of prices. Free markets and market-based processes do not reflect ecological reality. Prices reflect only short-term market supply and demand – prices of raw commodities and manufactured goods alike are far below the true costs of recovering, transforming, using and disposing of the resources involved. Free markets thus produce artificially low prices, and it is an economic axiom that under-pricing leads to overuse. Much of today's sustainability crisis derives from the fact that prices do not reflect the hidden resource depletion and pollution damage costs of economic goods and services.

Performance Assessment Systems

At present there are a number of systems that can provide a comprehensive performance assessment of buildings and encompass the wide variety of physical conditions, building traditions and environmental priorities that occur in different countries. One of them is the British system BREEAM (1990) (Building Research Establishment Environmental Assessment Method). BREEAM was designed as a tool for the market place, to send the correct signals to clients and occupiers who wish to do something for the environment. BREEAM is therefore focused on providing a credible transparent label for buildings,

either at the design stage, or for existing buildings.

On the basis of BREEAM, Canadian researchers have developed a similar system called BEEPAC (1994). The USA introduced LEED (1998) as an environmental buildings assessment system. Apart from North America, there are several different systems in the EU countries, for example ECO QUANTUM (1998) (The Netherlands), ECO-PRO (Germany), ESCALE (1998), EQUER (France), ECOEFFECT (1998) Sweden, ECOPROFILE (1998) Norway. These examples show that a great number of systems were developed after 1998 – the year of the first edition of GBC (Green Building Challenge) assessment method.

The GBC (Green Building Challenge) Project

The GBC '98 project consisted of two related elements: a two-year process of developing and testing a performance assesment model, called GBC Tool, and an international conference to mark the end of this process. The overall goal of GBC '98 was to develop, test and demonstrate an improved method for measuring building performance, and then to inform the international community of scientists, designers and builders about the result. The GBC '98 project was conducted by the teams of fourteen countries under Canadian management. The development and testing of the GBC Assessment Framework and the attendant GBCTool during the GBC '98 process exposed numerous detailed technical issues and more fundamental conceptual weaknesses. In addition to addressing these concerns, the assessment framework for GBC 2000 has been reviewed and applied by seven new participating countries from a wider geographical and cultural pool than in the first iteration.

The GBC project is still being extended and has transformed into a periodical, two-year stage, ending with the Sustainable Buildings Conference – a forum for the presentation of the new improved version for appreciation. This conference took place in Oslo on 23-25 September 2002.

The current researchers examine two different options of GBC '98 and GBC 2000. The main difference lies in the category classification for different performance criteria and subcriteria selection, although both assessment tools used the same methodology establishing a reference building as a benchmark and assess technical, economical and maintenance features of the buildings. (Table 1)

GBC Assessment Performance

Assessment implies measuring how well or poorly a building is performing, or is likely to perform, against a declared set of criteria. One of the significant contributions offered in the GBC is the explicit declaration of 'benchmarks' against which the performance of the case-study buildings are assessed. Using a common assessment scale offers the advantage of structuring the range of possible performance in a consistent and explicit manner. The GBC 2000 Assessment framework provides a measure of 1) the absolute performance in a selected set of performance criteria to contrast with other buildings in different regions (Environmental Sustainability performance), and 2) the environmental building performance of a case-study building relative to typical practice for that building type and region (Green performance).

Environmental Sustainability indicators are defined as a limited set of performance measures that characterise sustainable building practices and that would facilitate international comparability.

Table 1: Different performance criteria and subcriteria in GBC '98 and GBC 2000

GBC '98
Resources Consumption
Energy
Land
Water
Materials
Environmental Loadings
Airborne emission
Solid waste
Liquid waste
Other loadings
Quality of Indoor Environment
Air quality
Thermal quality
Visual quality
Moise and acquits
Controllability of systems
Longevity
Adaptability
Maintenance and performance
Process
Design and construction process
Building operations planning
Contextual Factors
Location and transportation
Loading on immediate surroundings

Table 1 (cont'd)

GBC 2000		
Environmental Sustainability Indicators	Loadings	Quality of service
Net annual consumption of primary energy for building operations	Emission of greenhouse gases	Flexibility and adaptability
Net area of land consumed for building and related works	Emission of ozone-depleting substances	Controllability of systems
Net annual consumption of water from building operations	Emission of gases leading to acidification	Maintenance of performance
Annual GHG emissions from building operations	Solid waste	Quality of amenities and site development
Resource Consumption	Liquid effluent	Economics
Life cycle energy use	Impacts on site and adjacent properties	Economic performance
Use of land and change in ecological value of land	Indoor Environmental Quality	Pre-Operations Management
Net use of water	Air quality and ventlation	Construction process
Net consumption of materials	Thermal comfort	Performance tuning
	Daylighting, illumination and visual access	Building Operations Planning
	Noise and acoustic	Measures taken to minimise commuting transport

The GBC Assessment Framework is operational through GBTool – configured to a Microsoft Excel platform. GBTool consists of a series of fourteen linked Microsoft Excel sheets – the main assessment framework, the result sheet, plus thirteen containing support information. Support sheets provide the basis for inputting relevant information as input to the scoring and weighting, as well as background information useful to interpret the significance of the results.

ECOPROFILE – Norway's Simplified Method to Assess Building Impact on the Environment

Ecoprofile is a method for simplistic environmental assessment of buildings and gives a good picture of the building's resources and environmental profile. A good environmental classification can lead to market advantage in the scale and rental of commercial buildings. Ecoprofile can also be used as an internal management and steering tool for the building owner.

A building's Ecoprofile can be visualised in two ways. The principal components can be combined in a bar graph indicating a large, medium or small environmental impact for 'external environment', 'resources', and 'indoor climate'. Rose diagrams show more detailed results. High values represent a large environmental impact in both types of diagram.

Ecoprofile for commercial buildings has been on the market since 1999, and it is planned to extend it to other types of existing building and as a planning tool.

The Swedish Method – ECOEFFECT – a Holistic Tool to Measure Environmental Impact of Building Properties

Ecoeffect is a method to calculate and assess the long-term environmental effects caused by the use of real estate. It has been developed for managers, consultants and constructors who need information about the environmental impacts associated with the built environment. Energy use, materials use, indoor environment and life cycle costs are treated individually in the analysis. The assessment is based on life cycle analysis (LCA) for use of energy and materials and on criteria for indoor and outdoor environment. The result is presented as an environmental profile for each area with bars showing potential environmental effects for different impact categories. A possibility of aggregating this information into a few environmental load numbers for each is offered to simplify a comparison between elements, buildings or estates. For use of energy and materials load numbers for emissions, waste and natural depletion can be calculated and for indoor and outdoor environment the load numbers that may be calculated represents ill health, discomfort, biodiversity and biological productivity.

The impact on health and comfort for people, staying out of doors is assessed from the physical conditions of surroundings, like distance to noise and pollution sources, exposure to high wind speeds, etc. The second impact group, biodiversity, is assessed from factors like access to free water surfaces, large trees, soil conditions etc. The last impact group, ecocycling, gives credit to waste separation, composting and storm water infiltration at the site.

The French Method ESCALE

Escale is a method able to assess the environmental quality of a building along with its design phases. Two levels of models exist, simplified and detailed, in order to square with the availability and accuracy of data. These modules are: a simplified module suit-

able for the upstream design phases, and a detailed module adapted to the Detailed Design and Project phases.

In the Escale method, the assessment based on each criterion (or sub-criterion) is the aggregated result, by weighted sum, of the assessment of the previous levels of the tree structure – similar to the GBC method. The performance scale is defined by a reference value.

The Escale method was developed in 2000. The first applications of the method to a real project have demonstrated its feasibility and presented a few of it potential used in decision-making. The missing modules are under development according to the same principle, and new tests will take place when these are entirely operational.

Conclusion

The methods of building environmental assessment have emerged as a result of climate change and are supposed to reduce gas emissions in accordance with Kyoto and other international protocols. Thus, in the year 1996 some highly developed countries, regarding their own natural resources, have started with the programme Green Building Challenge to improve the building sector towards sustainability. In Poland, the Energy Conservation Foundation and Technical University of Warsaw started research on sustainable building in 1997, but taking the wide scale of the research and their interdisciplinary nature into account the research must cover a wide variety of other institutes. Moveover there are some well known institutes in Poland which are keen on taking sustainable building problems into investigation. The bad thing is that neither Polish building sector nor developers have knowledge of this issue. However, taking the advantage of participation in GBC projects and having elaborated the assessment framework, they have a unique opportunity to adapt the method to local conditions and to plan investigations and research activities in a direction suitable to the assessment.

Conferences To Come

CIB World Building Congress 2004

May 2 - 7, 2004
Westin Harbour Castle Hotel, Toronto, Ontario, Canada

www.cib2004.ca

CIB 2004 will be held in conjunction with:
The 5th International Conference on Indoor Air Quality, Ventilation and Energy Conservation in Buildings, and
The 6th International Conference on Multipurpose Highrise Towers and Tall Buildings

This event is being organized under the direction of the CIB President, Dr. Sherif Barakat of the National Research Council's Institute for Research in Construction. This joint event will feature presentations on practical construction-related topics such as:

building processes and techniques
buildings and their environments
performance-based building and regulatory systems
sustainable construction
building and process re-engineering
tall buildings and highrise towers
indoor air quality and ventilation
thermal comfort and energy conservation

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CIB World Building Congress 2004

AIVC BETEC 2003

'Ventilation, Humidity Control and Energy'

International Energy Agency
AIVC
Air Infiltration and Ventilation Centre

The 24th Conference of the Air Infiltration and Ventilation Centre

12-14 October 2003: Hamilton Crowne Plaza Hotel, Washington DC, USA
Information: *aivc@bbri.be*, *www.aivc.org/Conferences/conferences.html*

First Announcement and Call for Papers

Abstracts and papers
Receipt of abstracts - 28 February 2003
Notification of abstract acceptance - 15 April 2003
Submission of papers - 15 August 2003

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

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

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.

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New to the ECBCS Bookshop - Latest Publications

Principles of Hybrid Ventilation, edited by Per Heiselberg

IEA ECBCS Annex 35: Hybrid Ventilation in New and Retrofitted Office Buildings

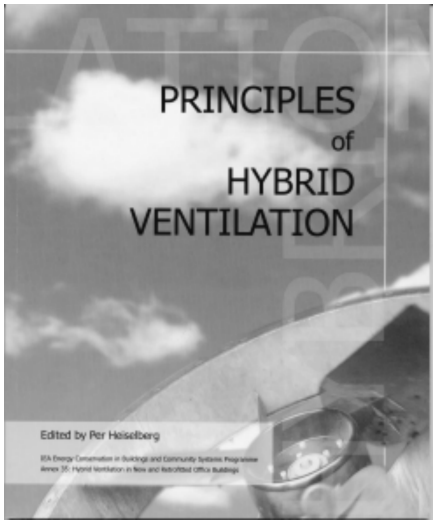
Report and CD Rom

Publisher: Aalborg University, Hybrid Ventilation Centre, Aalborg, Denmark, August 2002

The book summarises the work of the ECBCS project and is based on the research findings from the participating countries. With a focus on office and educational buildings, the booklet describes the principles of hybrid ventilation technologies, control strategies and algorithms, as well as analysis methods. The thirteen case studies include both newbuild and retrofit designs, and the booklet and information on the CD-ROM are valuable for both situations.

This booklet is aimed at newcomers to the field and gives and introduction to hybrid ventilation. A secondary aim is to function as a gateway for the more detailed information that can be found on the CD-ROM.

The CD-ROM is a source of information, containing a number of technical reports and papers, etc., with detailed information about research results. Included among these are: detailed reports with measurement results and conclusions from the case studies investigated.



The authors hope the booklet will be helpful for both architects and engineers in their search for innovative and energy-efficient ventilation solutions.

The booklet with accompanying CD is now available from the ECBCS Bookshop.

ECBCS Bookshop price: £20 plus postage and packing

Introduction to the Concept of Exergy – for a Better Understanding of Low-Temperature-Heating and High-Temperature-Cooling Systems, by Masanori Shukuya and Abdelaziz Hammache

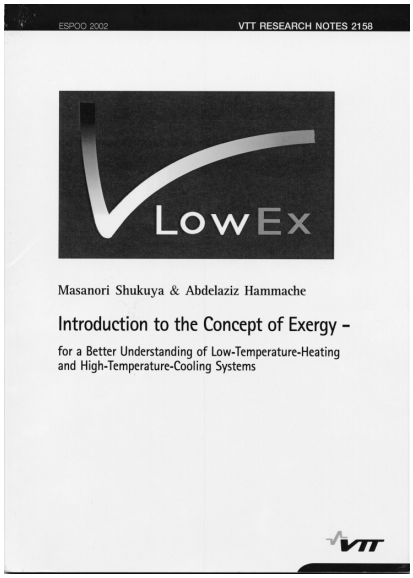
Publisher: VTT Technical Research Centre of Finland, Espoo, Finland, September 2002 (VTT Research Notes 2158)

ISBN 951-38-6074-4 (soft back ed.)

ISBN 951-38-6075-2 (URL *www.inf.vtt.fi/pdf/*)

An IEA ECBCS Annex 37: Low Exergy Systems for Heating and Cooling publication

Chapter 1 describes the characteristics of a thermodynamic concept, exergy, in association with building heating and cooling systems. Exergy is the concept that explicitly indicates 'what is consumed'. All systems, not only engineering systems but also biological systems including the human body, work feeding on exergy, consuming its portion and thereby generating the coresponding entropy and disposing of the generated entropy into their environment. The whole process is called 'exergy-entropy process'. The features of 'warm' exergy and 'cool' exergy and also radiant exergy are outlined. General characteristics of exergy-entropy process of passive systems, which would be a prerequisite to realise low exergy systems, are discussed together with the exergy-entropy process of the global environmental system.



Chapter 2 introduces the various forms of exergy and the mathematical formulations used to evaluate them. The exergy balance on an open steady state system, which is much more relevant to thermodynamic analysis of energy systems, is also described, as well as the different exergetic efficiency factors introduced in the thermodynamic analysis of energy systems. Next, and exergy analysis example is outlined through an air-conditioning application. Air-conditioning applications are widely used in heating and cooling of buildings.

Chapter 3 introduces an example of exergy calculation for space heating systems. The issues to have a better understanding of low exergy systems for heating and cooling are raised. It is suggested that a prerequisite for low exergy systems would be rational

passive design of building envelope systems.

ECBCS Bookshop price: £10 plus post and packing

Low Temperature Heating Systems: Increased Energy Efficiency and Improved Comfort

A twelve page booklet giving an overview of aspects of low temperature heating systems. Low temperature heating systems or high temperature cooling systems that are suitable for office buildings, service buildings and residential buildings, can use a variety of fuels and renewable energy sources. These systems use energy efficiently while providing a comfortable indoor climate.

In a low temperature system the distributing temperature of the water or air in the system is close to room temperature whereas in the traditional radiator distribution system, the temperature of the circulating water is between +50 and +80 Deg. C. If the heat distribution is managed using a low temperature underfloor heating system the temperature of the water is only about +25 to +35 Deg C. When the heat is distributed through the whole floor area, the temperature of the water can be much lower than that required in normal radiators.

The heat carrier in a normal cooling system is cooled to approximately +10 Deg C. In a high temperature system this temperature can remain as high as +20 Deg. C., which is close to the desired room temperature.

Low temperature systems successfully combine both traditional and innovative new approaches to heating. Usually the heat is transferred into the room through air or liquid circulation systems and the same system can often be used for both heating and cooling.

The booklet also lists a number case studies developed in this research project:

The Centre for Sustainable Building, Kassel, Germany - This project demonstrates the implementation of a new low temperature hydronic heating and cooling system.

Lycee Leonard de Vinci, Calais, France – This is a demonstration project for the French High Environmental Quality (HEQ) approach.

Carisven, Heerlen, The Netherlands – A demonstration project for the Dutch sustainable and low-energy building programme. It is comprised of 54 semi-detached houses, and is situated in the city of Heerlen.

IDIC Research Centre, Iwate, Japan – Chilled radiators for radiant cooling and dehumidification.

The Laboratory Building 'La Casa Intelligente', Rome, Italy – Located in the ENEA centre in Casaccia. Many energy efficient technologies and national programmes are developed here for the residential sector.

Villa Waehlin, Stocksund, Sweden – A demonstration project for STEP, the new, lighter structure building system. The exterior walls consist of large polystyrene block elements that are connected to each other with U-shaped shield metal profiles.

The Sibelius Hall, Lahti, Finland – This is the largest wooden building constructed in Finland for over one hundred years.

The Aaltoalvari Water Sport Centre, Jyvaskyla, Finland – Originally designed by the world famous Finnish architect, Alvar Aalto.

Available at: *www.vtt.fi/rte/projects/annex37/lowexenglanti.pdf*

Simplified Tools CD, including Handbook, edited by Lars Goran Mansson

An IEA ECBCS Annex 27 'Evaluation and Demonstration of Domestic Ventilation Systems' publication

Publisher: FaberMaunsell Ltd on behalf of the International Energy Agency Energy Conservation in Buildings and Community Systems Programme, 2002, ISBN 0-9542670-1-X

The overall objective of the study was to develop tools for better selection of domestic ventilation systems, that can better predict the expected indoor climate and make a choice for the most likely situations in dwellings. The aim of the handbook is to give guidance on how to use the tools for evaluating domestic ventilation systems in different situations. The tools developed were for energy, thermal comfort, noise, inside to outside pressure difference, life cycle cost, reliability, user and building aspects, indoor air quality for constant emission sources. CO2, tobacco smoke, cooking products, water vapour in habitable rooms and the bathroom, and are available in the program Venset, available on the accompanying CD.

ECBCS Bookshop price: £60 plus VAT

Sustainable Solar Housing: Marketable Housing for a Better Environment (Annex 38)

The goal of the research task described in this four page booklet was to help designers plan economical sustainable housing to increase market penetration and assure that the goals promised customers are met. It explored the combination of energy conservation and solar strategies in the context of marketable sustainable housing. The booklet gives and outline of the various tasks carried out

as part of the project. The results include an internat web site offering advice for accelerating market penetration of high-performance housing; design guidelines for high performance, environmentally friendly and affordable housing; testing reports to manufacturers for key building and technical system components; documentation of exemplary sustainable solar housing, and open houses and press articles.

Available at: *www.iea-shc.org/task28/downloads/T28_brochure_print.pdf*

New Annex 5 Technical Notes published

New AIVC Technical Note - TN 57 'Residential Ventilation',

by Peter Concannon
AIVC Technical Note 57, 2002,
70 pp, Code TN 57

New AIVC Technical Note - TN 56 'A Review of International Literature Related to Ductwork for Ventilation Systems'

by Tor G. Malmstrom
AIVC Technical Note 56, 2002,
62 pp, Code TN 56

Both AIVC technical notes are available with the September 2002 edition of 'Air Information Review', which can be ordered with a subscription to the newsletter and CD. Visit *www.aivc.org/Subscriptions/aivc_subscriptions.htm* for details.

About the ECBCS

ECBCS Strategic Plan

The new strategic plan can be found at:

www.ecbcs.org/ECBCS_Strategic_Plan_2002-2007.pdf

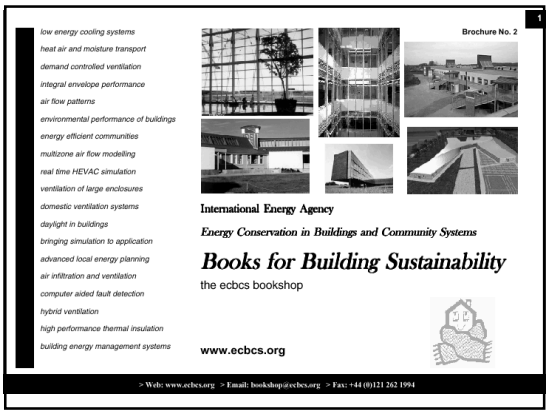
ECBCS Annual Report

The latest annual report is now available on the website at:

www.ecbcs.org/ECBCS_Annual_Report_2001-2002.pdf

New Bookshop Brochure

A new ECBCS bookshop brochure 'Books for Building Sustainability' is now available in print or online (*www.ecbcs.org*) describing the latest additions to the Bookshop.



The ECBCS Bookshop - www.ecbcs.org

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5 Air Infiltration and Ventilation Centre (1979-)

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31 Energy Related Environmental Impact of Buildings

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35 Control Strategies for Hybrid Ventilation in New and Retrofitted Office Buildings - HybVent (1998-2002)

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36 Retrofitting in Educational Buildings – Energy Concept Adviser for Technical Retrofit Measures (1998-2002)

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37 Low Exergy Systems for Heating and Cooling of Buildings (1999-2003)

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38 Solar Sustainable Housing (with Solar Heating and Cooling Task 28) (2000-2005)

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39 High Performance Thermal Insulation Systems (2001-)

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40 Commissioning of Building HVAC Systems for Improving Energy Performance (2001-)

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