Indoor Air EnVIE

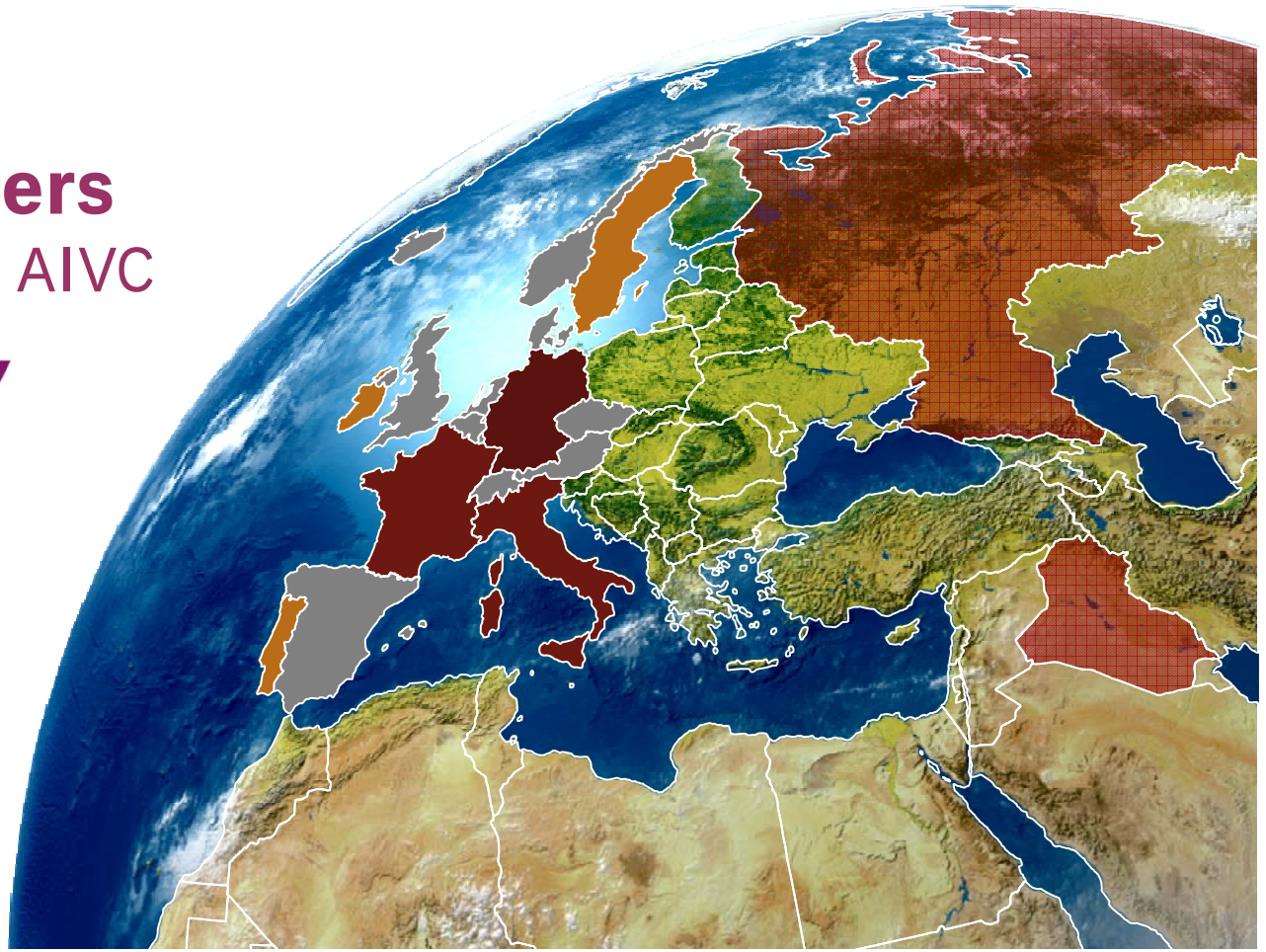
SIXTH FRAMEWORK PROGRAMME 2002-2006

Energy Building Codes and IAQ concerns:

Status, opportunities and threats

Peter Wouters

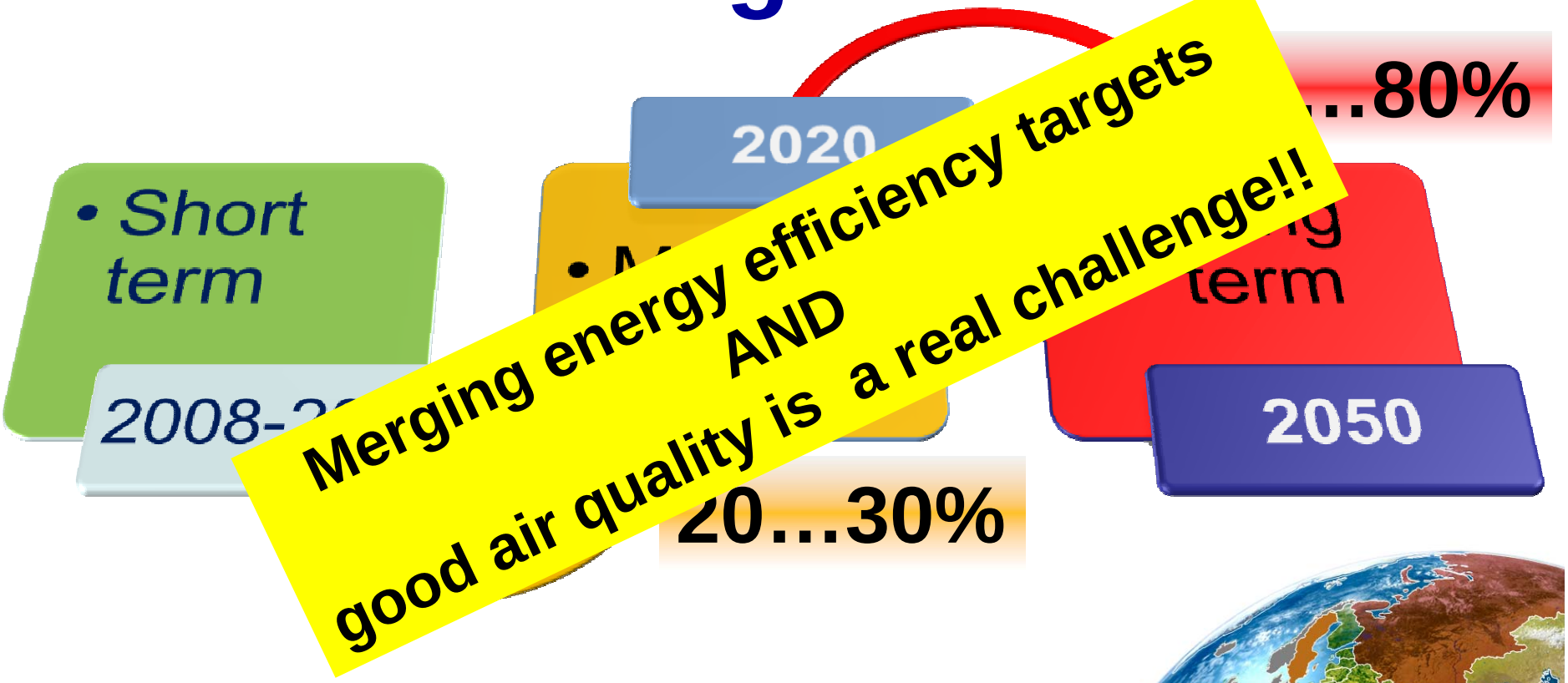
Operating Agent AIVC



Structure of the presentation

- The concerns regarding Energy
- Which European instruments for action?
- Some challenges
- Conclusions

Time horizon for energy targets



Which European instruments for action?

- CPD?
- EPBD?
- Other directives?
- Other possibilities?

CPD and EPBD

- **CPD – Construction Product Directive**
  - Adopted in 1989
  - Focus on characterisation and free movement of building products but NOT on the works themselves
- **EPBD – Energy Performance of Buildings Directive**

  Adopted in 2002, with as ambition to be implemented in 2006

CPD and EPBD

- **CPD – Construction Product Directive**

  Identical methods for characterising the performances of building products

- **EPBD – Energy Performance of Buildings Directive**

  Impose minimum requirements regarding energy efficiency, whereby attention for indoor climate

CPD and IAQ concerns
Essential requirement N° 3

3. Hygiene, health and the environment

The construction work must be designed and built in such a way that it will not be a threat to the hygiene or health of the occupants or neighbours, in particular as a result of any of the following:

- the giving-off of toxic gas,
- the presence of dangerous particles or gases in the air,
- the emission of dangerous radiation,
- pollution or poisoning of the water or soil,
- faulty elimination of waste water, smoke, solid or liquid wastes,
- the presence of damp in parts of the works or on surfaces within the works

About the EPBD

Objective of the EPBD

Promoting the improvement of energy performance of buildings within the EU through cost-effective measures, with **no compromise** to **comfort** and **Indoor air quality**.

The required measures by all Member States

- Apply a Methodology for integrated building energy performance
- Minimum requirements for new buildings and for large existing buildings undergoing a major renovation
- Certification schemes for all buildings
- Inspection & assessment of boilers and air conditioning

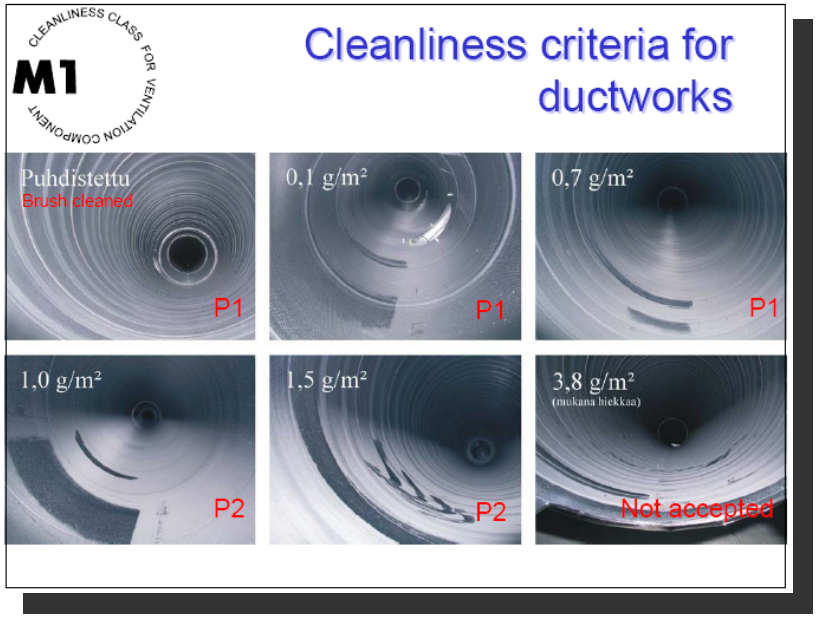
EPBD - Methodology for the integrated energy performance of buildings

Annex : The methodology of calculation of energy performances of buildings shall include at least the following aspects:

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

EPBD and inspection of installations

- Inspection of boilers and air conditioning systems is required
- It is **NOT** required to have inspection of ventilation systems!



Recasting of the EPBD

- Issues of concern, e.g. :
  - Which buildings to be included?
    - 1000 m² limit
  - Should EPBD define the minimum energy performances by country?
  - Or should it stimulate MS to pay attention to compliance issues, to carry out studies about economic optimum, to …

Which options for (New of revised) Directive?

Requirement that MS impose procedures and requirements

Explicit requirements

Requirement to MS to show that one is ambitious in targets and implementation

The EPBD Buildings Platform

The EPBD Buildings Platform is an **information service** for helping the implementation of the Buildings' Directive

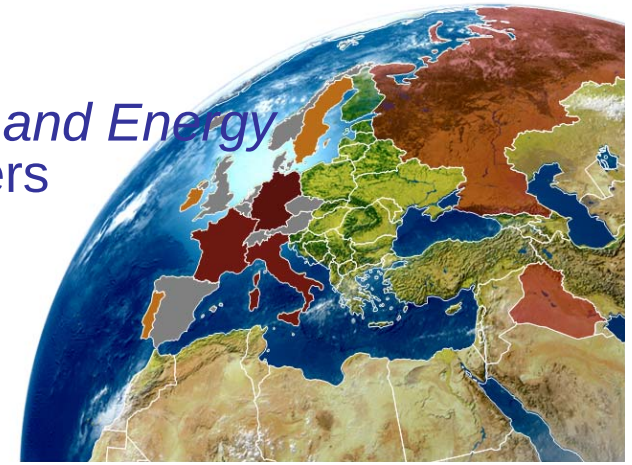
The Platform has been launched by the European Commission in the frame of Intelligent Energy – Europe Programme

Period : 2006-2008

The Buildings Platform acts as the official EC information channel for EPBD related issues

Managed by **INIVE** EEIG

International Network for In formation on Ventilation and Energy Performance, as leader of a consortium of 13 partners

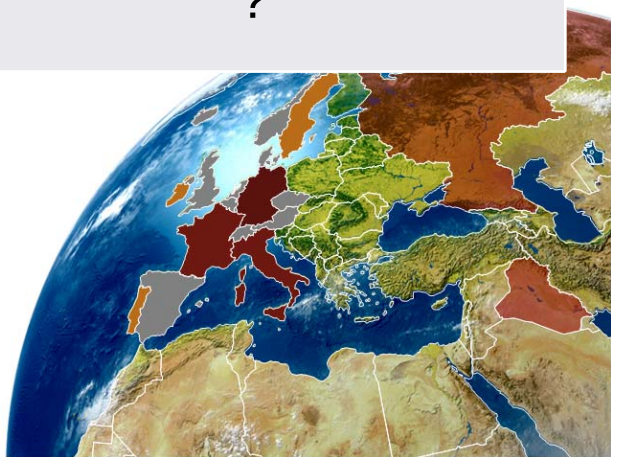


Issues of concern

- How to cover IAQ in ventilation regulations?
- How to cover IAQ in EPBD implementation?
- Compliance?

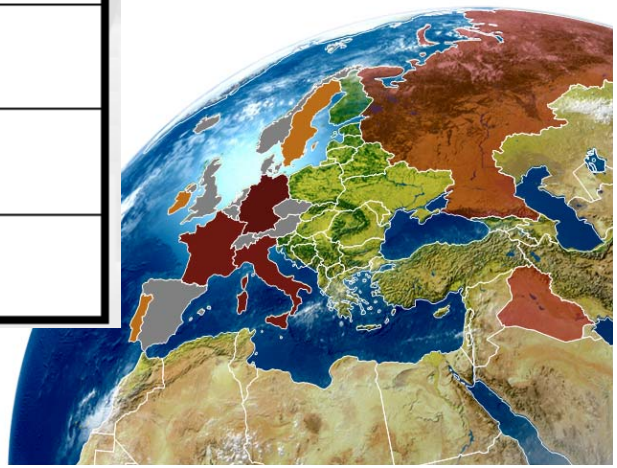
Indoor air quality concerns

Examples of possible actions		
Objective	Europe	Member State
To characterise	CEN testing standard	-
Minimal requirements	CEN product standard	-
Stimulate - IAQ	CEN ventilation standards	Ventilation requirements
Stimulate – Energy	EPBD and CEN	Energy requirements
Impose “Healthy” materials	New directive?	?



Compliance with regulations?

Airflow		Required	Measured
Supply	Living room	150	21
	TV room	75	5
	Bedrooms	36	7
Exhaust	Kitchen	75	20
	Toilet	25	9
	Service room	72	6
	Bathroom	50	7



AD Amersfoort

www.AD.nl

zondag 30 maart 2008

Kamer: Stop 'ziekmakende' ventilatie

AMERSFOORT/ DEN HAAG - Het is onacceptabel dat honderdduizenden mensen gezondheidsrisico's lopen door het energiezuinige ventilatiesysteem in hun nieuwbouwhuis.

Dat vindt de Tweede Kamer. Minister Vogelaar (Wijken) moet van de Kamer de bouwers aanpakken of het systeem verbieden.

Branche-organisatie Bouwend Nederland stelt dat het systeem wordt gebruikt om te voldoen 'aan de steeds strengere energie-eisen, zonder dat onderzoek is gedaan naar de gezondheidsrisico's', zegt voorzitter Elco Brinkman.

Vogelaar en Brinkman reageren op tv-programma *Zembla* van gisteravond. Hierin bestempelde hoogleraar gezondheidstechniek Annelies van Bronswijk de energiezuinigste woningen als ongezond. Ze doelt op 400.000 woningen met 'balansventilatiesysteem', waarbij afgevoerde lucht de binnenkomende lucht verwarmt en ramen moeten dichtblijven. Ze wil een verbod op dat systeem.

Letselschadeadvocaat Martin de Witte is in de Amersfoortse nieuwbouwwijk Vathorst gestuit op 310 huishoudens met gezondheidsklachten. Het gaat om long- en oogontstekingen.

INTERNATIONAL WORKSHOP

INIVE

BUILDING AdVENT

rehva

Energy Conservation in Buildings and Community Systems Programme

AIVC

ASIEPI

Trends in national building ventilation markets and drivers for change

Belgium, Ghent,
18-19 March 2008

An initiative of AIVC, organised by INIVE EEIG, in collaboration with REHVA and with the European SAVE ASIEPI and SAVE BUILDING ADVENT projects.

Sponsors

Vventibel

RENSON

BRINK Climate Systems

alusta

DAIKIN

J.E. StorkAir

aereco

Supported by the EPBD Buildings Platform

EPBD Buildings

Envie Cor

INTERNATIONAL WORKSHOP

INIVE

BUILDING AdVENT

rehva

International Energy Agency
Energy Conservation in Buildings and Community Systems Programme

AIVC

ASIEPI

Trends in national building ventilation markets and drivers for change

Envie Conference – Brussels 17 September 2008

Ventilation Information Paper n° 20
May 2008

Operating Agent and Management
Boulevard Poincaré 79
B-1060 Brussels – Belgium
Inive@bbri.be - www.inive.org

International Energy Agency
Energy Conservation in Buildings and Community Systems Programme

Air Infiltration and Ventilation Centre

Trends and drivers in the Finnish ventilation and AC market

J. Kurnitski, O. Seppänen
TKK, Finland

1 Introduction

Finland is the county with the highest penetration rate of mechanical supply and exhaust ventilation and air conditioning in the EU. Almost all new residential buildings are equipped with mechanical heat recovery ventilation. Air conditioning systems with mechanical supply and exhaust ventilation with chilled beams have been a standard solution in office and public buildings for the last ten years. Arguably Finland uses the highest indoor climate standard in the world with an outdoor air ventilation rate of 2 l/s per m^2 and air velocities below 0.2 m/s in office-type buildings.

There are several reasons for the high indoor climate standard in Finland:

- A cold climate has been an effective driver for the ventilation system development. Passive stack and mechanical exhaust ventilation (both widely used in older Finnish buildings) evidently cause draft and enormous energy use in a cold climate.
- Finland, like other Nordic countries, has a strong manufacturing industry for air handling units, ventilation components and room conditioning units, etc.
- Regulations stated as minimum requirements in the building code for ventilation have formed the standard for residential buildings, especially for apartment buildings. However, detached houses have already been above the minimum stabdard for the last 20 years by using a higher standard with heat recovery ventilation.
- Performance based ventilation regulations, with most requirements being for indoor climate and fewer requirements for system-specific issues, have offered a good background for innovative solutions.
- Finland has had successful and large-scale research programs in the area of indoor climate and ventilation technology during the last 20 years. Research conducted in close cooperation with the manufacturing and construction industries as well as with building owners and officials has led to widely-used voluntary guidelines and the labelling system that have drastically changed the market.
- The Finnish indoor climate classification is arguably the most advanced one in the developed world.

In this paper, important aspects and achievements in innovative ventilation/indoor climate technology will be identified and discussed. The developments during recent decades, as well as the latest changes, will be reported. For some aspects, such as the air tightness and energy performance of buildings, a lack of drivers can also be shown, as the development has been slower compared to other Nordic countries.

Ventilation Information Paper n° 19
May 2008

Operating Agent and Management
Boulevard Poincaré 79
B-1060 Brussels – Belgium
Inive@bbri.be - www.inive.org

International Energy Agency
Energy Conservation in Buildings and Community Systems Programme

Air Infiltration and Ventilation Centre

Trends in the French building ventilation market and drivers for changes

François Durier
CETIAT, France

1 Introduction

This paper presents evolutions of the French building ventilation regulations and market, with attention paid to IAQ, energy, air tightness and the assessment of innovative systems.

France[1] has 61 millions inhabitants (2006). Building stock includes[2] 30.7 millions dwellings (2005), 33% built before 1949. Main dwellings are houses (56%) and apartments (44%). Their mean surface[1] is 90 m^2 for 2.4 persons and their mean final energy consumption[2] is 208 kWh/m^2/year, 74% for heating and ventilation. Occupants are owners (56%) or tenants (38%). 402 000 new dwellings have been built in 2006[1] (57% houses, 43% apartments).

Non-residential heated buildings surface[2] is 840 millions m^2, 2/3 of them for shopping, offices and education. Their mean energy consumption[2] is 222 kWh/m^2/year, 63% for heating, ventilation and domestic hot water. Non-residential new buildings[3] built in 2007 are for offices (4.5 Mm^2), shopping (4.7 Mm^2), health care (3.4 Mm^2), culture (2.2 Mm^2), education (2 Mm^2), industry, agriculture or storage of goods (23.2 Mm^2).

[1] Source: INSEE. www.insee.fr
[2] Source : ADEME. www.ademe.fr
[3] Source : MEDAD, 2008. www.developpement-durable.gouv.fr

2 National trends in IAQ requirements and market

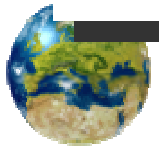
2.1 Requirements on ventilation of dwellings

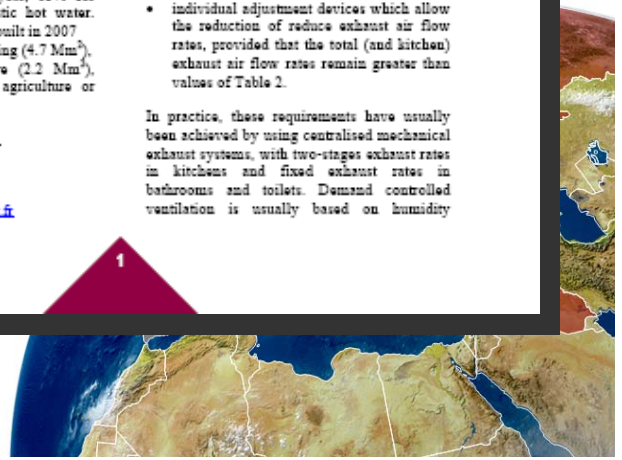
The French regulation concerning residential buildings ventilation mainly relies on the *« Arrêté du 24 mars 1982 relatif à l'aération des logements »* [1]. This order relates to air renewal in new dwellings.

Its main requirements are :

- overall and continuous air renewal,
- air inlets (natural or mechanical) in main rooms, which can be adjustable or self-adjustable, but cannot be blocked,
- air exhausts (natural or mechanical) in kitchen, bathroom(s), toilet(s),
- ventilation system that must be able to ensure exhaust air flow rates mentioned in Table1 (simultaneously or not),
- individual adjustment devices which allow the reduction of reduce exhaust air flow rates, provided that the total (and kitchen) exhaust air flow rates remain greater than values of Table 2.

In practice, these requirements have usually been achieved by using centralised mechanical exhaust systems, with two-stages exhaust rates in kitchens and fixed exhaust rates in bathrooms and toilets. Demand controlled ventilation is usually based on humidity





V entilation
I nformation
P aper
n° 29
August 2008

Operating Agent
and Management
Lozenberg 7
B-1932 Sint-Stevens-Woluwe
Belgium
Inive@bbri.be - www.inive.org

International Energy Agency
Energy Conservation in Buildings
and Community Systems Programme

Air Infiltration and Ventilation Centre

An overview of national trends in envelope and ductwork airtightness

François Rémi Carrié, CETE, France
Bernd Rosenthal, e.u.[z.], Germany

1 Introduction

This paper summarises presentations and discussions that took place during the workshop entitled " Trends in national building ventilation markets and drivers for change" held in Ghent, Belgium, in march 2008 with a specific focus on envelope and ductwork airtightness. Before this workshop, experts were asked to provide information regarding the trends in ventilation in their country and the difficulties they felt to improve the situation in terms of market penetration of innovative systems, indoor air quality and energy use requirements, and compliance check schemes. This has resulted in a body of literature published as Information Papers which can be downloaded from the EPBD buildings platform. Based mostly on these papers and on the workshop discussions, this paper starts summarising energy savings estimates and energy regulation measures ; it continues with a number of issues that have been stressed by the experts such as indoor air quality impacts, airflows through insulation layers, airtightness databases and metrics, and finally, ways to explore to achieve good airtightness.

2 Estimates of energy impacts

One key reason behind the interest for envelope and ductwork leakage lies in their potential impact on the energy performance of a building. Three countries provided quantified information with this regard for the workshop. In Belgium and in Germany, it is estimated that envelope airtightness accounts for about 10% of the energy performance level. In addition, these countries estimated that the potential benefit of better envelope airtightness is similar to the installation of solar collectors. These orders of magnitude apply also to France, where the energy wastage due to envelope leakage lies between 2 to 5 kWh/m^2/year per unit of n_{50} for the heating needs. For ductwork airtightness, the range is 0 to 5 kWh/m^2/year for the heating needs; in addition, fans also use more electricity in leaky ductwork systems. In the US, there exists a significant body of literature on duct leakage with rough estimates of 10 kWh/m^2/year for commercial buildings on the fan energy use. A typical California house with ducts located in the attic or crawlspace wastes approximately 20% of heating and cooling energy through leaks and draws approximately 0.5 kW more electricity during peak cooling periods.

Workshop – lessons learned…

- Enormous differences between countries regarding national ventilation markets
  - Not possible to only explain by climate, buildings types, …
- Differences are much bigger than e.g. thermal insulation requirements or energy requirements


Market control
National measures
European instruments

A new directive on IAQ?

- If yes, what is the purpose of the directive :
  - Impose to MS the implementation of minimum requirements?
  - Impose MS to :
    - evaluate the national measures for achieving good IAQ in buildings
    - Evaluate which additional measures are required or, if not, why it is not necessary to change

Which options for (New of revised) Directive?

Explicit requirements on products, systems and procedures

Requirement to MS to impose procedures and requirements

Requirement to MS to show that one is paying attention to the use

A new directive on IAQ?

- If adopted, a **Concerted Action** can be a very valuable tool
- Concerted Action?
  - EC funded networking of delegates from MS for exchanging experiences and actions in order to accellerate the implementation of a directive and to limit the divergency
  - Exist for EPBD since 2005
    - Phase 2 - highly appreciated
  - Started up for ESD

Conclusions - 1

- There are already a whole range of legal instruments which could be used for stimulating better IAQ
  - CPD, EPBD
  - National ventilation and energy regulations
- Most of these instruments don’t pay enough attention to the IAQ issues
- Major implementation challenges
  - Compliance of regulations
  - Performances during lifetime

Conclusions - 2

- Which possibilities for achieving improvements?
  - New directive?
  - Refinement of present European instruments?
  - Awareness and support actions for effective implementation by Member States?
  - …

Conclusions - 3

- If a new Directive :
  - What should be the focus?
  - A concerted Action might be a very efficient support measure