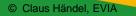


The Voice of the European Ventilation Industry

ISH 2019



How to evaluate indoor air Qualitty

- Jelle Laverge, University of Ghent
- Yves Lambert, Renson
- Jelmer de Jong, Brink Climate Systems



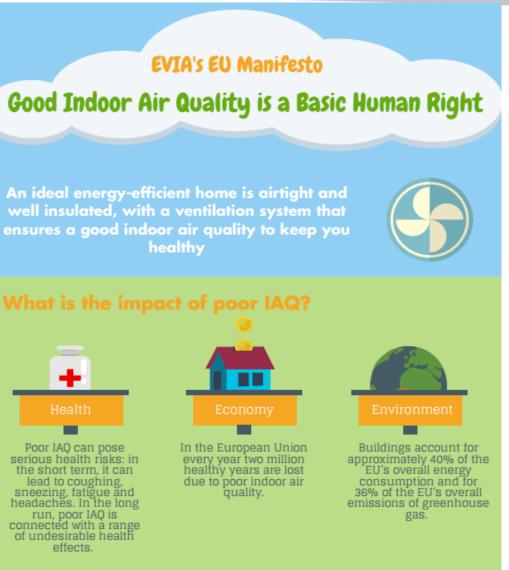
Dipl.- Ing. Claus Händel Technical Secretary European Ventilation Industry Association Avenue des Arts 46 1000 Brussels, Belgium Tel.: +32 2 732 70 40 E-mail: haendel@fgk.de

Good Indoor Air Quality is a Basic Human Right

EPBD

- The 2009 WHO guidelines provide that, concerning indoor air quality, better performing buildings provide higher comfort levels and wellbeing for their occupants and improve health.
- 'Article 2a Long-term renovation strategy

 (g) an evidence-based estimate of expected energy savings and wider benefits, such as those related to health, safety and air quality.
- The energy needs for technical building systems shall be calculated in order to optimise health, indoor air quality and comfort levels defined by Member States at national or regional level.
- THE SMART READINESS OF BUILDINGS the interoperability between systems (... regulation of indoor air temperature within the building and indoor air quality sensors and ventilations);



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Regulatory Perspective EPBD

Currently - No Indicator for IAQ in Building Certificates

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Figure 5: Residential EPC, France²⁴ DIAGNOSTIC DE PERFORMANCE ENERGETIQUE - logement (6.A)

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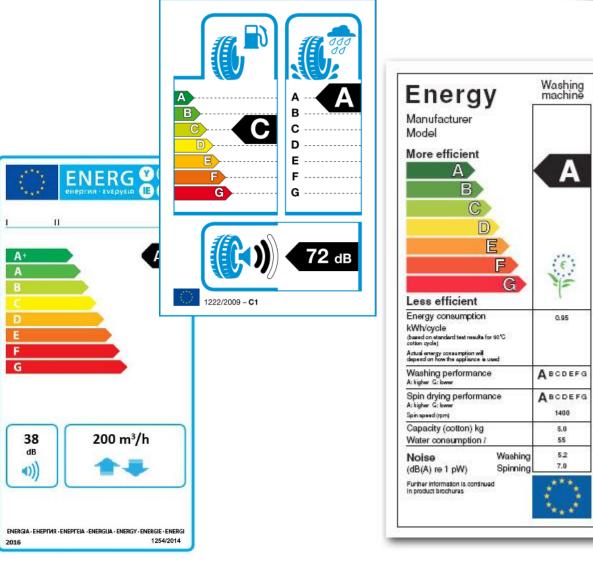
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Currently no indicator for IAQ Parameters in ErP Label

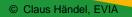
- No indicator for IAQ controls options
- No indicator for filtration
- No indicator for sufficient air volume floe design
- Simply energy aspects are missleading
- Other products sometime have additional indicators
 - Washing maschines
 - Tyres





Industry views with respect to smart ventilation as an enabler of Indoor Air Quality

Yves Lambert, Renson





"WE ARE LIVING IN THE AGE OF THE IPHONE, YET THE ARCHITECTURE AND CONSTRUCTION INDUSTRIES ARE STILL IN THE WALKMAN PHASE" QUOTE UNSTUDIO - BEN VAN BERKEL



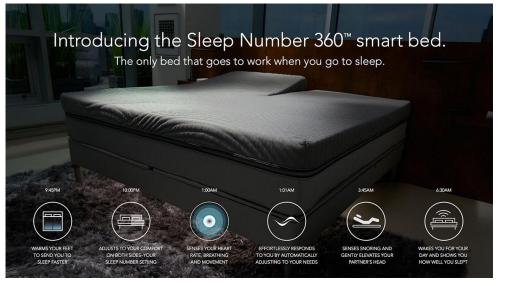
Smart items in our daily life ?



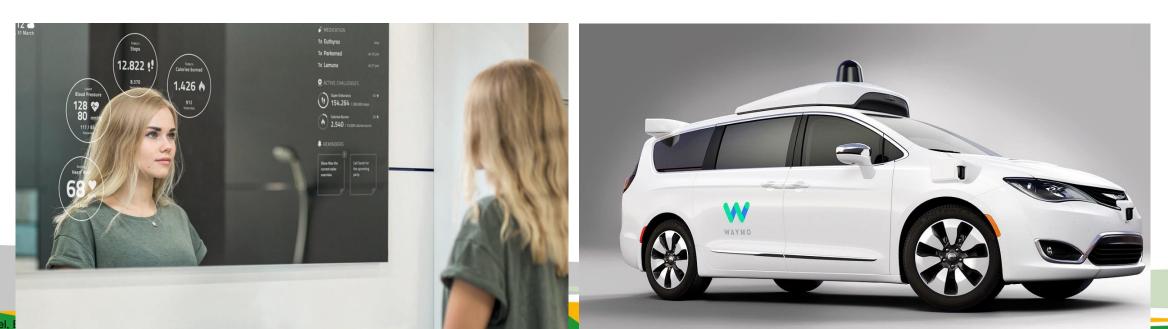












Smart home ?

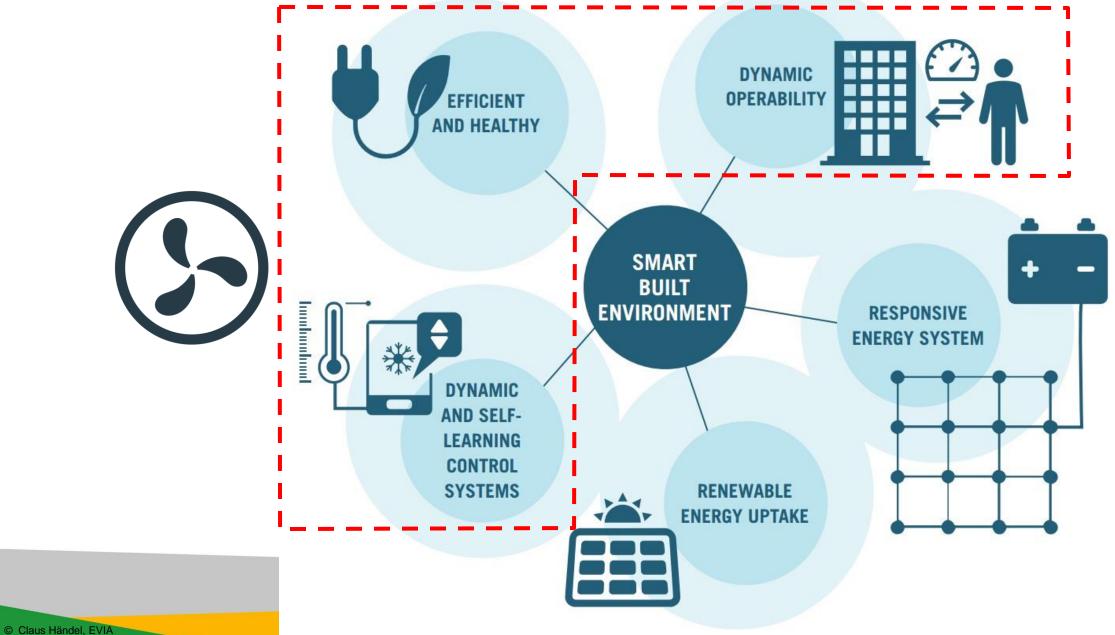






Smart ventilation ?



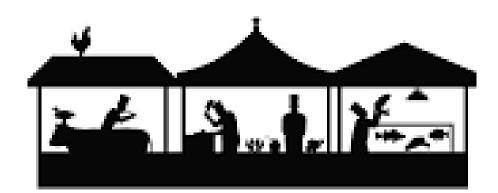


Economic reality









THE MARKET



11



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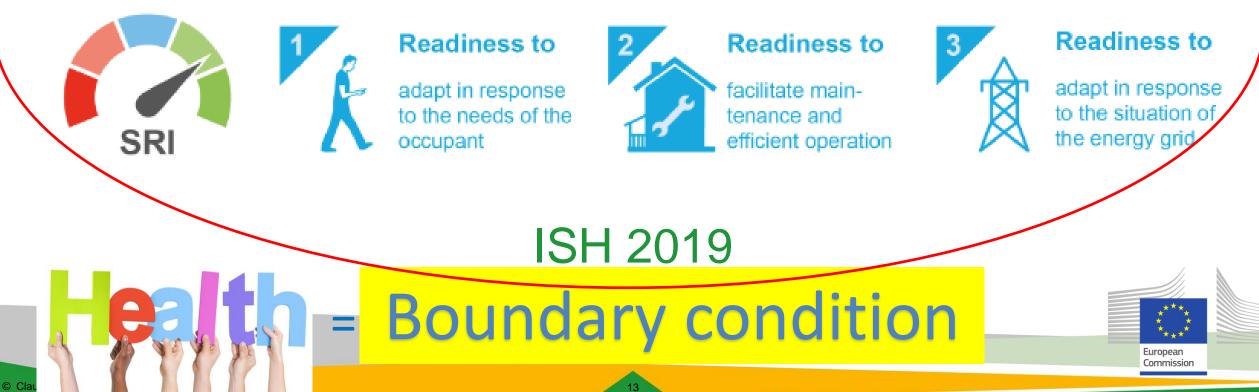
Smart ventilation in SRI



Focus on ENERGY

Smart Readiness Indicator - SRI

Measure the technological readiness of your building





Smart ventilation in Ecodesign Lot 6 ?



14

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Simulate IAQ or measure ?



Ventilation system

- Demand controlled
- IAQ sensor based
 - Data online

15



User

- Feedback on IAQ
- Increase awareness



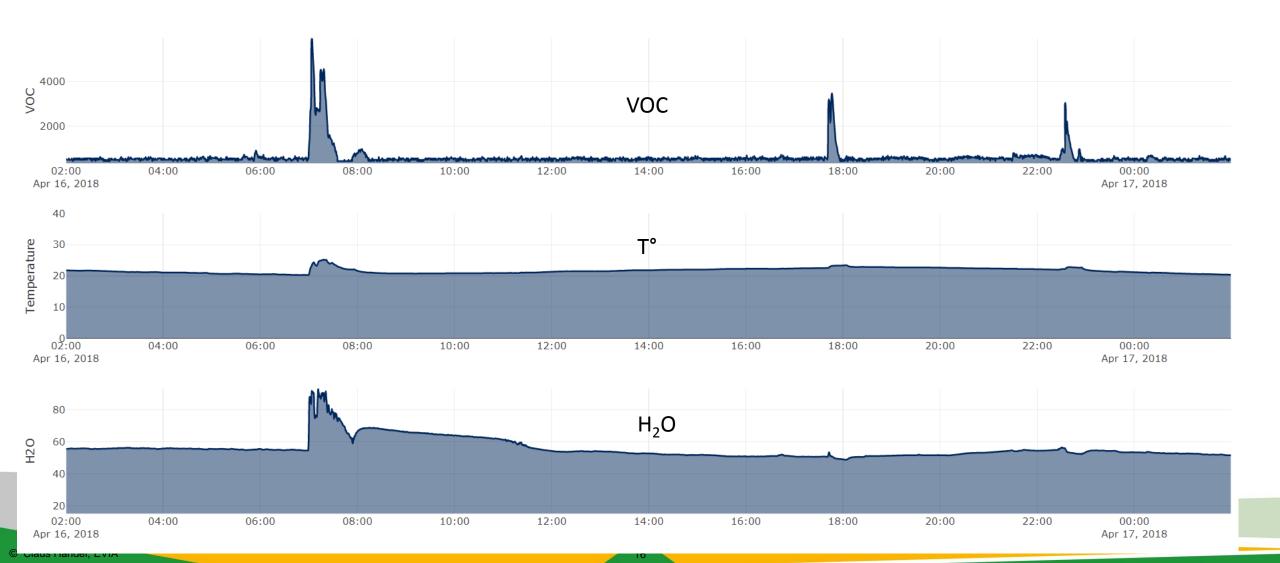
Installer

- Status
- Maintenance

To measure is to know

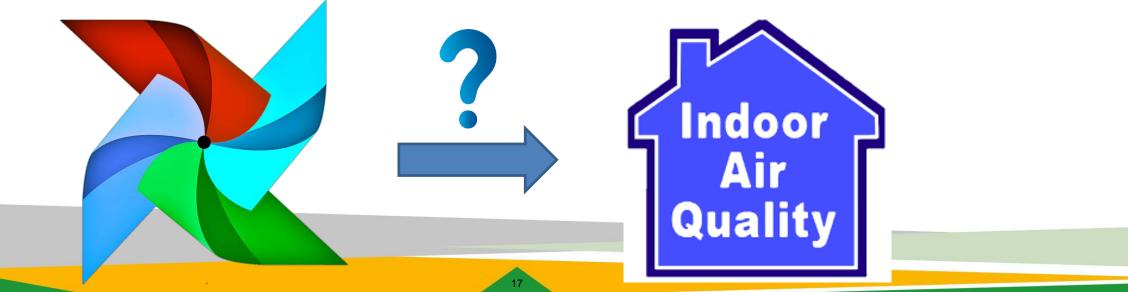












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We believe



Future Smart Ventilation IAQ

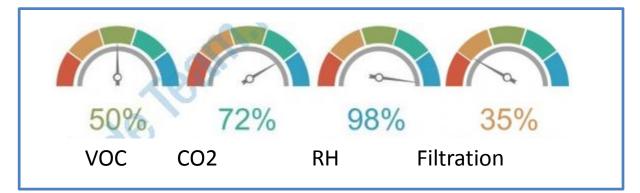
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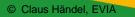
18





EVIA IAQ label









IAQ label main targets

- o Raise awareness of the impact of smart ventilation systems on IAQ
 - Help to move the market to efficient solutions (sensors, filtration, etc ...)
 - Assert the main purpose of ventilation system -> improving IAQ
- Complement energy aspects (energy labelling)
 - Introduce efficiency of ventilation system on IAQ in parallel to their energy efficiency.
- Propose a European common method for all type of mechanical ventilation
 systems existing in Europe
- Label has to be clear and simple to understand by the general public

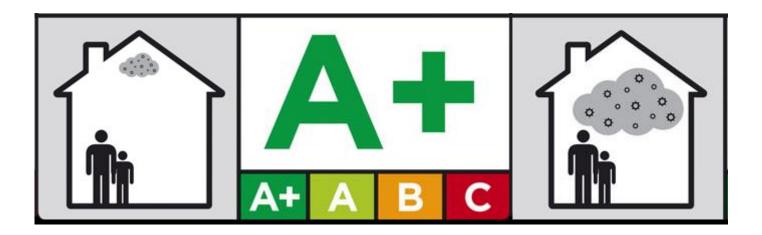




Proposal voluntary IAQ label

Ventilation performance system X

@ installed capacity of 1.0 [l/s/m²] for habitable spaces



21







22

taskforce

Van Holsteijn en Kemna BV (VHK) Elektronicaweg 14 2628 XG Delft The Netherlands www.vhk.nl Department of Architecture and Urban Planning Jozef Plateaustraat 22 9000 Gent Belgium www.ugent.be

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A method for assessing the effectiveness of a ventilation system





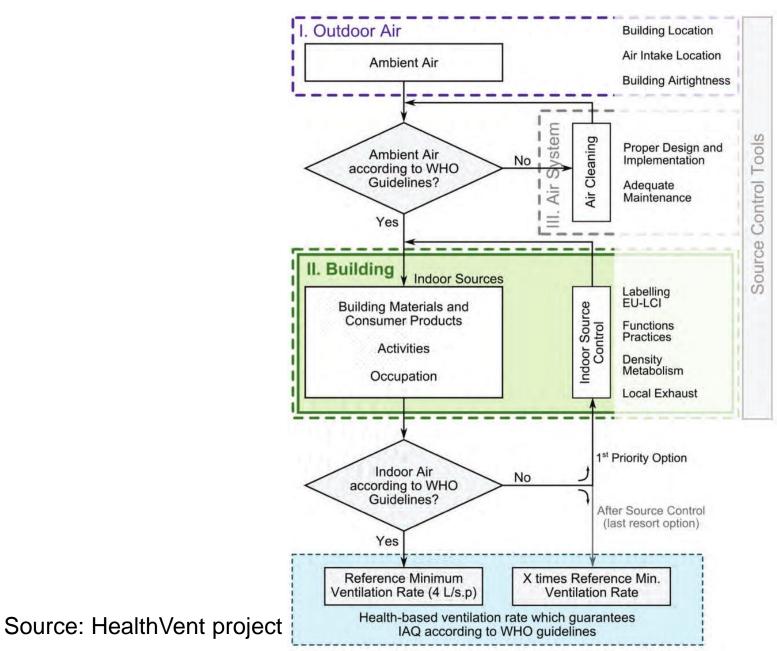
DEPARTMENT OF ARCHITECTURE AND URBAN PLANNING BUILDING PHYSICS, CONSTRUCTION AND SERVICES RESEARCH GROUP If there is a pile of manure in a space, do not try to remove the odor by ventilation. Remove the pile of manure.

Max von Pettenkofer, 1858

VENTILATION IS NOT A PANACEA

IAQ control strategy:

- **1. Source control**
- 2. Local exhaust
- 3. General ventilation





A good (residential) ventilation system should

- reliably deliver
- the needed amount of fresh air
- at the location
- and the time needed



ASSESSMENT METHOD



WHAT DO WE EXPECT?

A European performance assessment of residential ventilation systems should:

- be an indicator for ventilation performance
- include essential features of the layout of the dwelling
- work for natural and mechanical ventilation
- include control
- be European



<u>AEP AND AER</u>

No. HS	Design extract airflow rates in I/s				
10.115	kitchen	bathroom	other HS	if 1 toilet	if more toilets
1	20	10	10	10	10
2	25	10	10	10	10
3	30	15	10	10	10
4	35	15	10	15	10
≥5	40	15	10	15	10

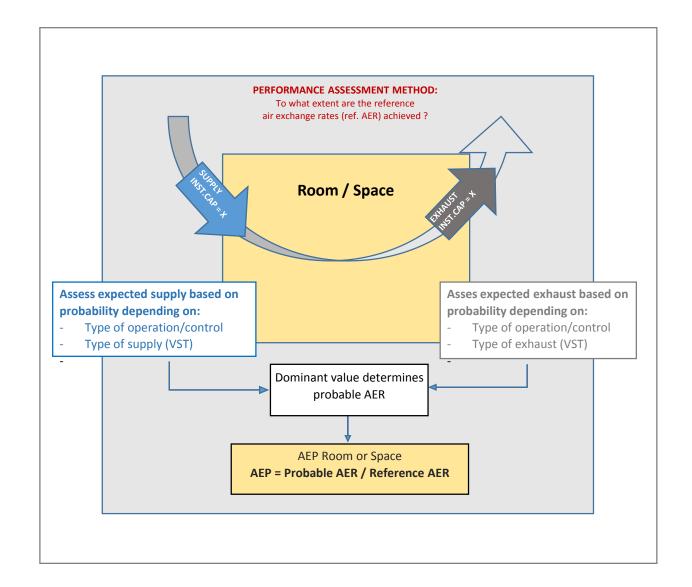
Category	Multiplication factor for airflow rates defined in table 6.3
I	1.4
II	1.0
III	0.7
IV	0.5

$$AEP_{HS;i} = AER_{HS;i} / AER_{ref} = (q_{v;inst;HS;i} \cdot Pq_{v;inst} \cdot f_{cntrl;HS;i}) / AER_{ref}$$

	HS	supply	Natural Direct Supply	NDS	$10^{e} Perc$;NDS \cdot P windward/leeward
1		exhaust	Natural Indirect Exhaust	NIE	PCONDS · Pdrs;HS · Pinf
T	ES	supply	Natural Indirect Supply	NIS	$P_{drs;ES}$
	exhaust	Natural Direct Exhaust	NDE	10 ^e Perc;nds+nde	



OVERALL SCHEME







A method for assessing the effectiveness of a ventilation system





DEPARTMENT OF ARCHITECTURE AND URBAN PLANNING BUILDING PHYSICS, CONSTRUCTION AND SERVICES RESEARCH GROUP



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Ventilation in building; Dutch determination method with focus on IAQ

Jelmer de Jong, Brink Climate Systems



NEN1087 AND IAQ



- Required Air Flow Rates in wet and habitable spaces are specified in the Dutch building regulation
- Studies shown that ventilation systems that fully comply with the Dutch building regulations, shown in practice major differences in their performance in terms of indoor air quality
- Even stronger, an installed capacity according to the requirements guarantees not automaticly a good IAQ
- In 2017 a new determination method for ventilation is started; the NEN1087
- Parallel approach to the EVIA IAQ label

NEN1087 AND IAQ



- Introduction of a Air Exchange Performance factor (AEP)
 AEP strongly depending on:
 - Type of controls (in habitable and wet rooms)
 - Mechanical of natural driven forces
 - Direct or indirect exhaust and supply in the rooms
 - (with or without overflow components)
- AEP less depending on:
 - Airthightness of the dwelling

VENTILATIE SYSTEEM TYPE VST6

VST4 : Mechanische afzuiging in natte ruimtes en verblijfsruimtes gecombineerd

met mechanische toevoer in de verbindingsruhtte(s)						
VST6	NATTE RUIMTES (EXHAUST SPACES (ES))	VERBLIJFSRUIMTES (HABITABLE SPACES (HS))				
TOEVOER VOORZIENINGEN	MIS	MIS				
AFVOER VOORZIENINGEN	MDE	MDE				

1

2

3

4

5

6

BRINK

INPUT ALLEEN GELE CELLEN INVULLEN! Geef karakteristieke lekdichtheid (qv10) van de woning in $dm^3/m^2/s$: qv10 0,50 Geef type en aantal van natte ruimtes (ES) en verblijfsruimtes (HS) eparate keuken badkamer toilet utility ander total ES verblijfsruimtes number number number number number number number otal surface area in m² 5 110,00 2 2 0 5 1 0 MDE in I/s 63,00 Geef type BVU CENTR. BIDIR. VENT. UNIT| VARIABLE FLOWRATE | VARIABLE FLOWRATE RATIO BETWEEN SPACES kies BVU-type MINIMAAL TE INSTALLEEREN CAPACITEIT CONFORM BOUWBESLUIT in I/s MDE-capaciteit ES: 63,00 MDE en NDS-capaciteit : 99,00 min. vereiste gereduceerde MDE-capaciteit ES: 9,45 vereiste gereduc.MDE en NDS-capaciteit : 16,50 Specificeer MDE-capaciteit HS: Specifeer te installeren MDE- capaciteit per type ES in I/s: eparate_keuken badkamer ander toilet utility totaal MDE verblijfsruimtes 44,00 21,00 7,00 100,00 l/s/m² 0,90 l/s 99,00 Specificeer gereduceerde MDE-cap. Specifeer gereduceerde MDE- capaciteit per type ES in I/s: 1,05 9,45 0,150 I/s 16,50 3,15 2,10 l/s/m² Resulterende MDS cap.verbindingsruimte 116,50 ma 25,95 Benodigde capaciteit MIS (overstroomvoorz.) ES als % van MDE conform BB Benod, capaciteit MIS HS als % van MDE conform BB 100% 100% 100% 100% 100%

KANS DAT BB-CONFORM VENTILATIEDEBIET OP VERTREKNIVEAU OPTREEDT : AEP

OUTPUT

AEP ES	absence	presence	weight. avg
separate_keuken	230%	161%	184%
badkamer	100%	15%	43%
toilet	157%	66%	96%
utility			
ander			
gemiddeld ES	97%	89%	92%

AEP HS	absence	presence	weight. avg
verblijfsruimtes	193%	64%	77%

Gemiddeld ventilatiedebiet (AER) over gehele woning @ forfaitaire bezetting

7 Geef type regeling MDE vanuit ES: MDE keuken MDE badkmr MDE toilet MDE

MDE keuken	MDE badkmr	MDE toilet	MDE utility	MDE ander	
control type					
manual	no control	manual			

Geef type regelingen HS:					
MDE verblijfsruimtes					
%HS oppervl. control type					
100% manual					

AER WONING	dm³/s	m³łh	ach	dm³/s/m² A _{tot}
totaal	50	179	0,75	0,32

NEN1087 AND IAQ



Overview:

- Good insight of the performance of a system in practice.
- Overall Air Flow Rate in the whole dwelling sufficient.
- Big differences in IAQ during presence in habitable rooms
- Best performance of systems with at least one mechanical driven force in the habitable rooms (exhaust or supply).
 Best performance with IAQ sensor in rooms instead of a central menual central.
 - central manual control.

NEN1087 AND IAQ



To do:

- Argumentation (partly scientific) for probability values
- Create market acceptance
- Determine a minimum AEP value
- Make a connection to the energy calculation



Ventilating Europe

