



The Voice of the European Ventilation Industry

ISH 2019

How to evaluate indoor air Quality

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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);

EVIA's EU Manifesto

Good Indoor Air Quality is a Basic Human Right

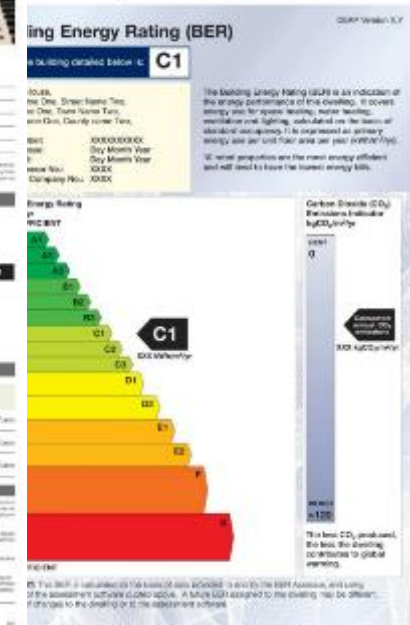
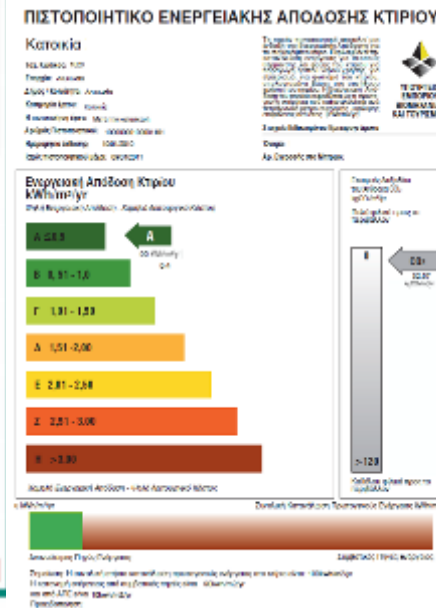
An ideal energy-efficient home is airtight and well insulated, with a ventilation system that ensures a good indoor air quality to keep you healthy



What is the impact of poor IAQ?

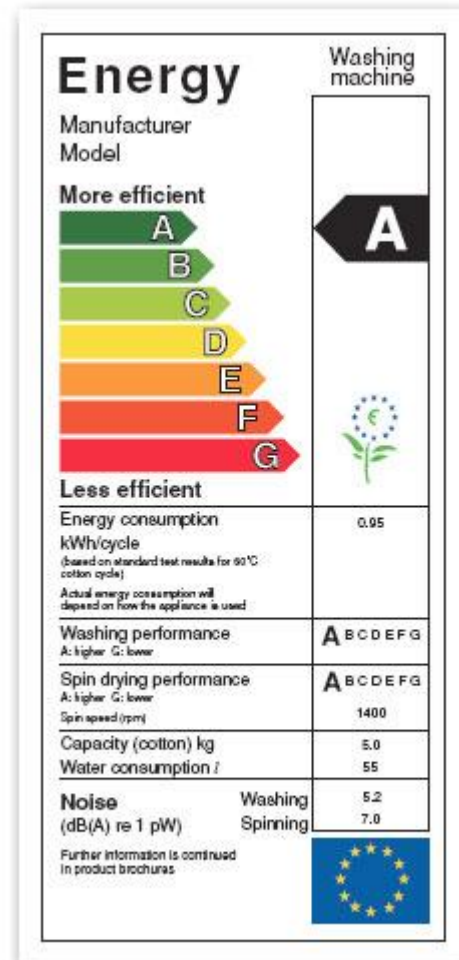
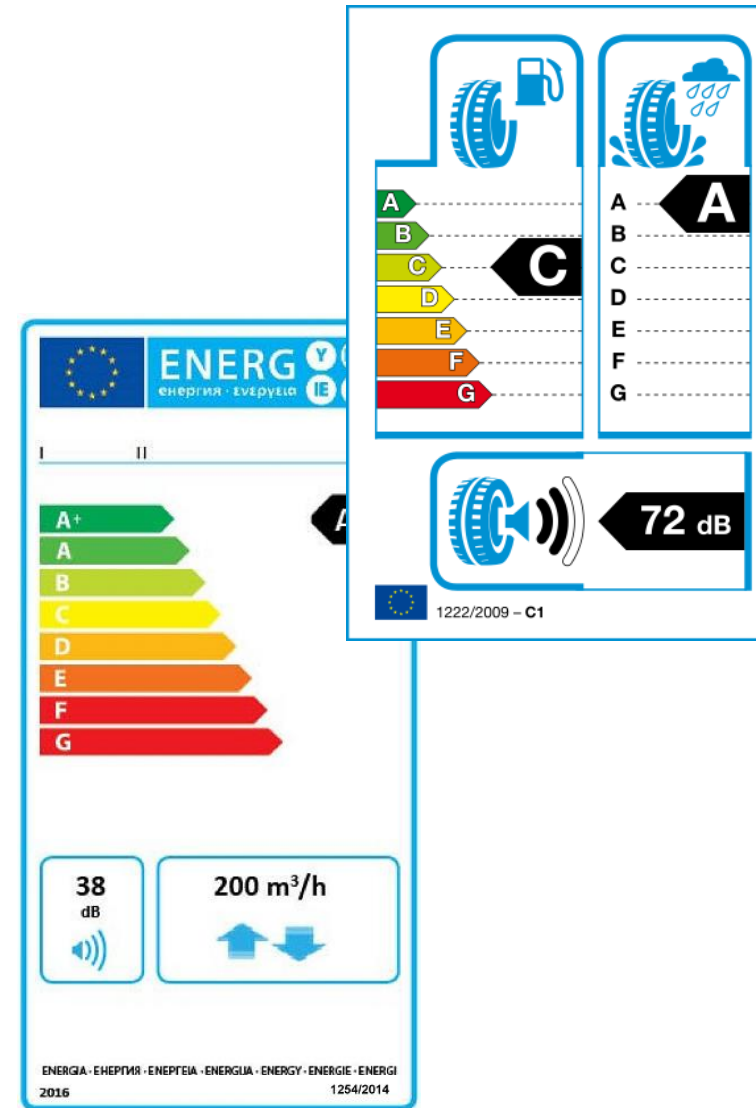
Health	Economy	Environment
 <p>Poor IAQ can pose serious health risks: in the short term, it can lead to coughing, sneezing, fatigue and headaches. In the long run, poor IAQ is connected with a range of undesirable health effects.</p>	 <p>In the European Union every year two million healthy years are lost due to poor indoor air quality.</p>	 <p>Buildings account for approximately 40% of the EU's overall energy consumption and for 36% of the EU's overall emissions of greenhouse gas.</p>

Currently - No Indicator for IAQ in Building Certificates



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 flow design
- Simply energy aspects are misleading
- Other products sometime have additional indicators
 - Washing machines
 - 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”***

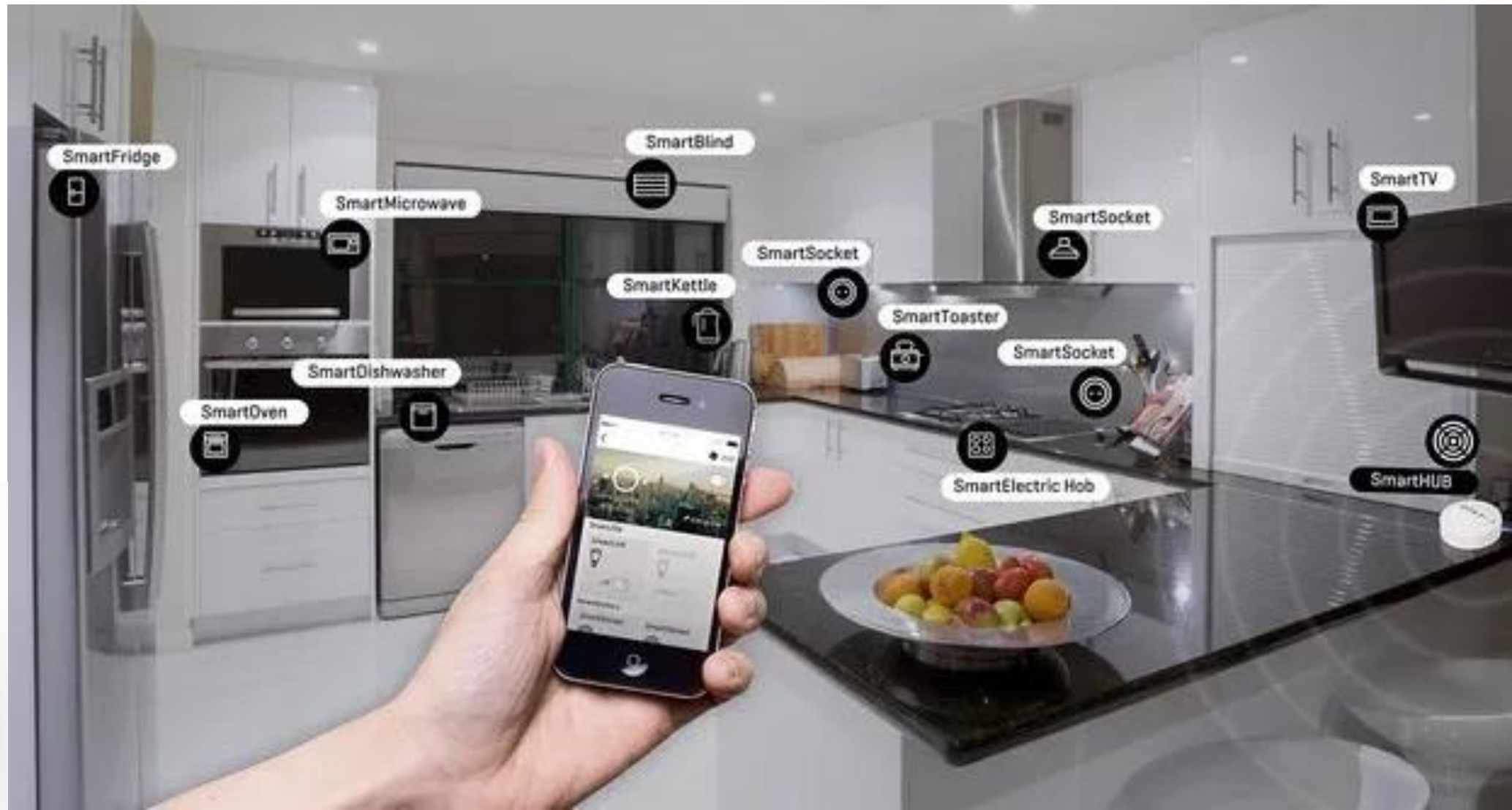
QUOTE UNSTUDIO - BEN VAN BERKEL



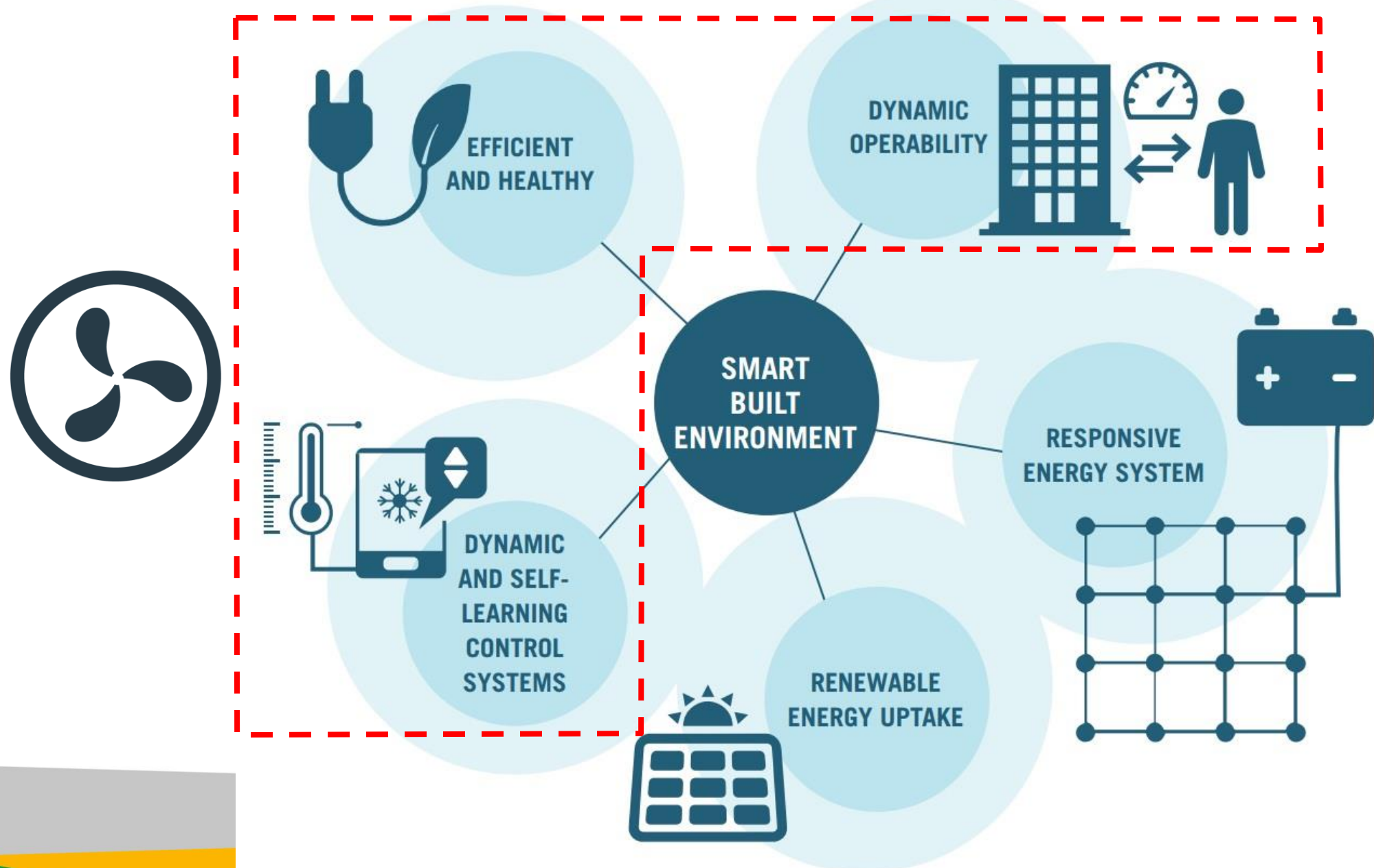
Smart items in our daily life ?



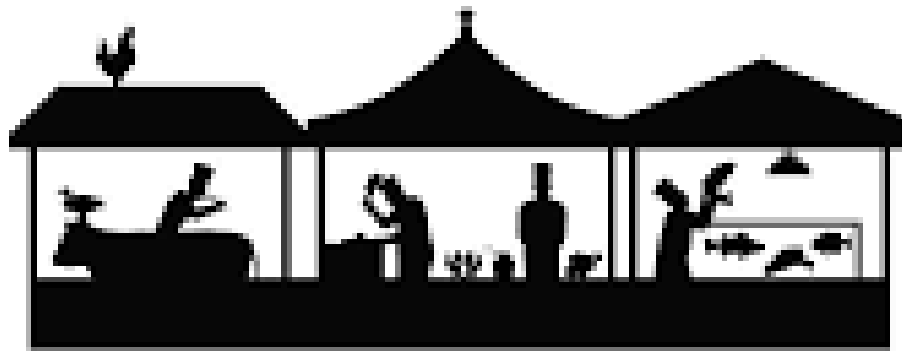
Smart home ?



Smart ventilation ?



Economic reality



THE MARKET



The background of the slide is a lush, dense tropical jungle. It is filled with various types of green plants, including large palm fronds, broad-leafed plants, and a variety of smaller foliage. The lighting is bright, creating a vibrant green scene. In the center of the image, the text "It's a jungle out there." is written in a large, white, sans-serif font with a subtle drop shadow, making it stand out against the complex background.

It's a jungle out
there.

Focus on ENERGY

Smart Readiness Indicator - SRI

Measure the technological readiness of your building



1



Readiness to
adapt in response
to the needs of the
occupant

2



Readiness to
facilitate main-
tenance and
efficient operation

3



Readiness to
adapt in response
to the situation of
the energy grid

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Health

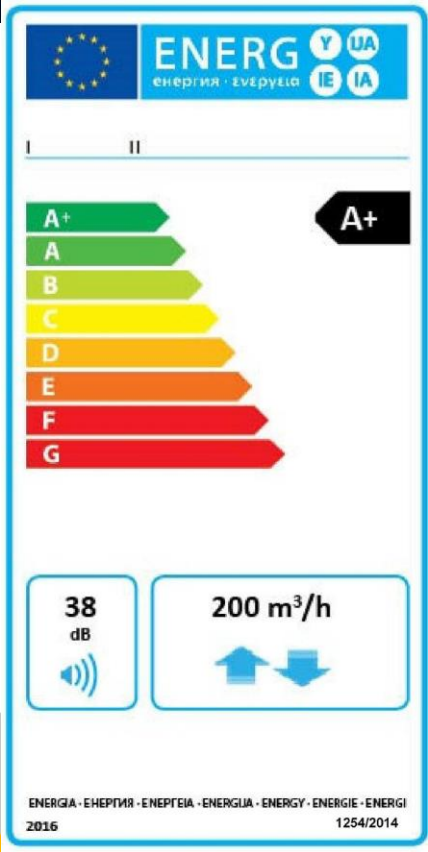
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Boundary condition

Smart ventilation in Ecodesign Lot 6 ?



HEALTH



Simulate IAQ or measure ?



Ventilation system

- Demand controlled
- IAQ sensor based
 - Data online



Installer

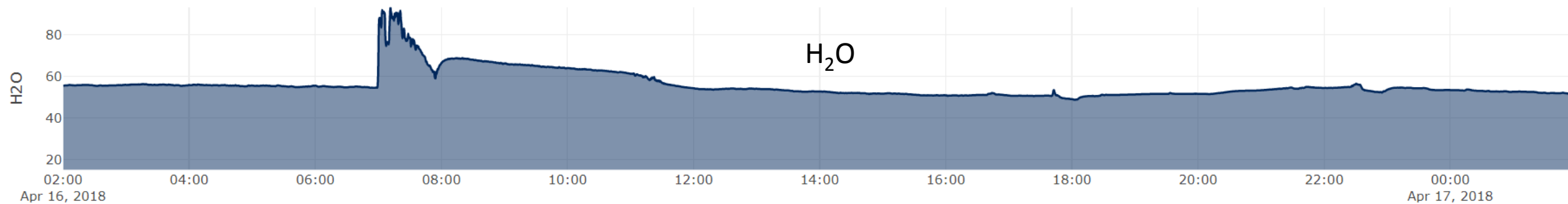
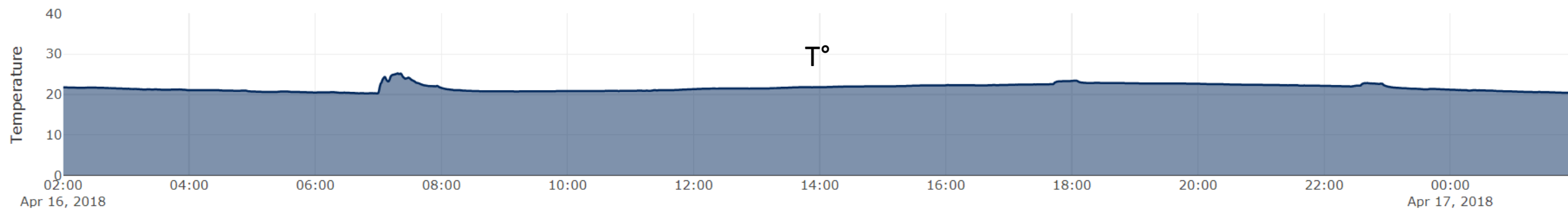
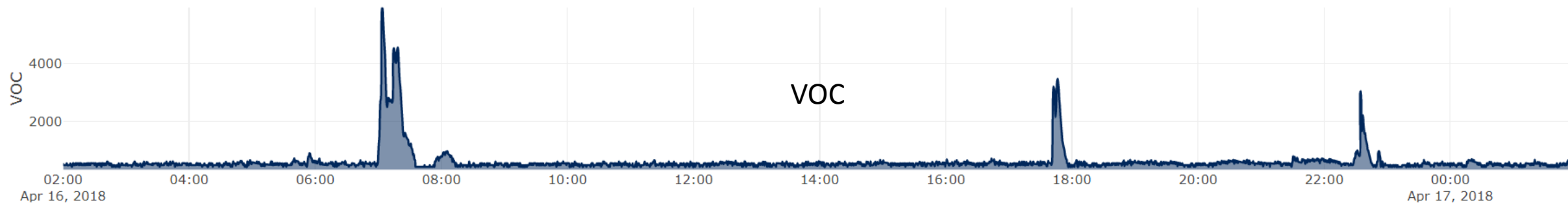
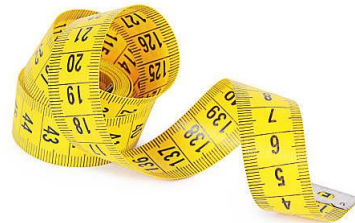
- Status
- Maintenance



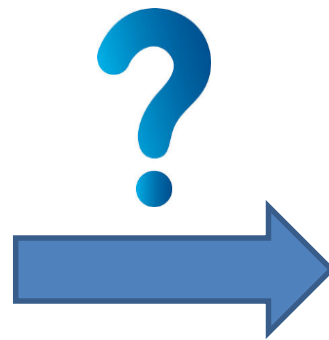
User

- Feedback on IAQ
- Increase awareness

To measure is to know



Dare to Dream



We believe



Future

**Smart
Ventilation
IAQ**

THE FUTURE IS OURS TO CREATE.

EVIA IAQ label



IAQ label main targets

- 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



Scientific partners



taskforce



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**GHENT
UNIVERSITY**

VENTILATION PERFORMANCE

A method for assessing the effectiveness of a ventilation system

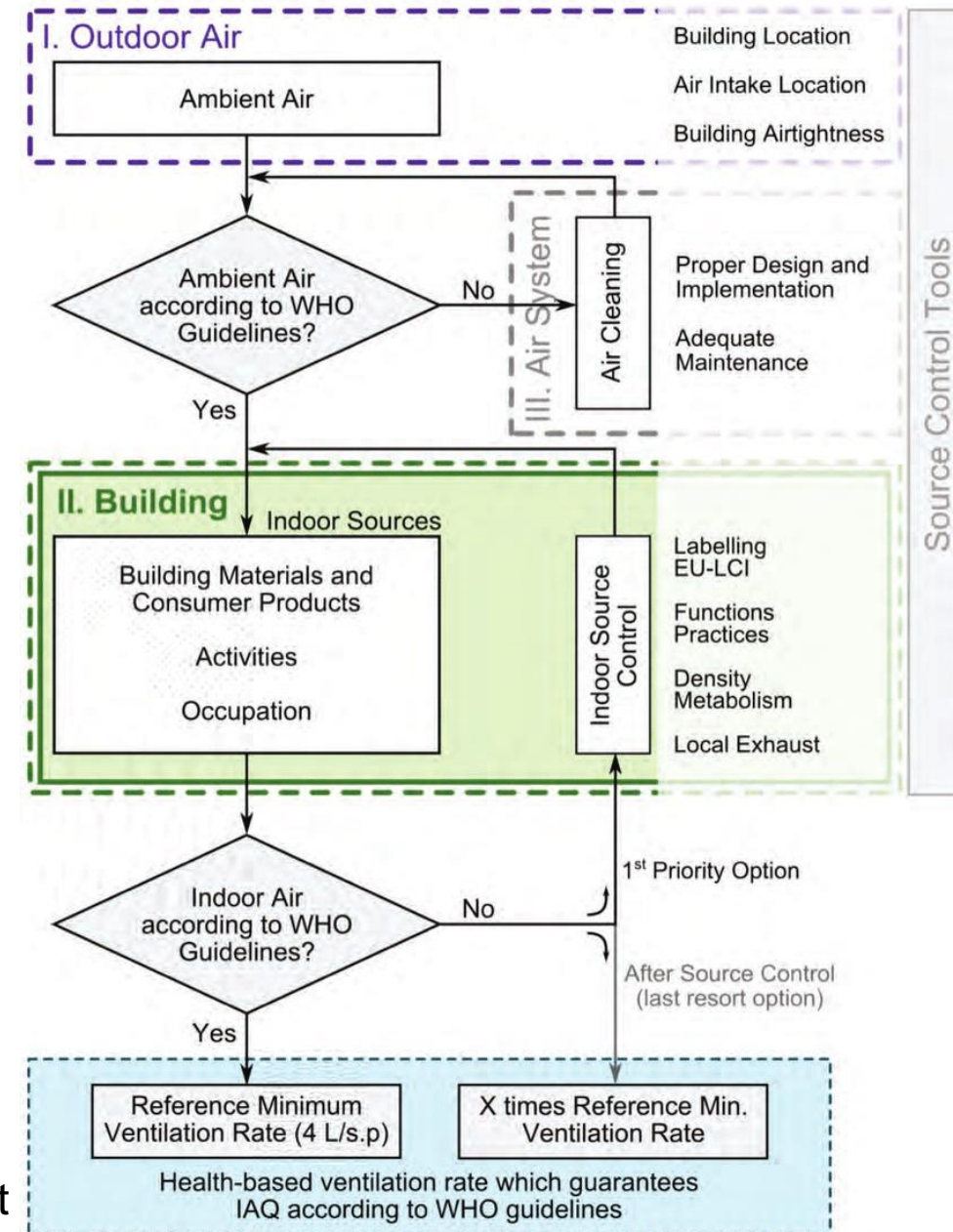
*If there is a pile of manure in a space,
do not try to remove the odor by ventilation.
Remove the pile of manure.*

Max von Pettenkofer, 1858

VENTILATION IS NOT A PANACEA

IAQ control strategy:

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



WHAT DO WE EXPECT?

- 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

AEP AND AER

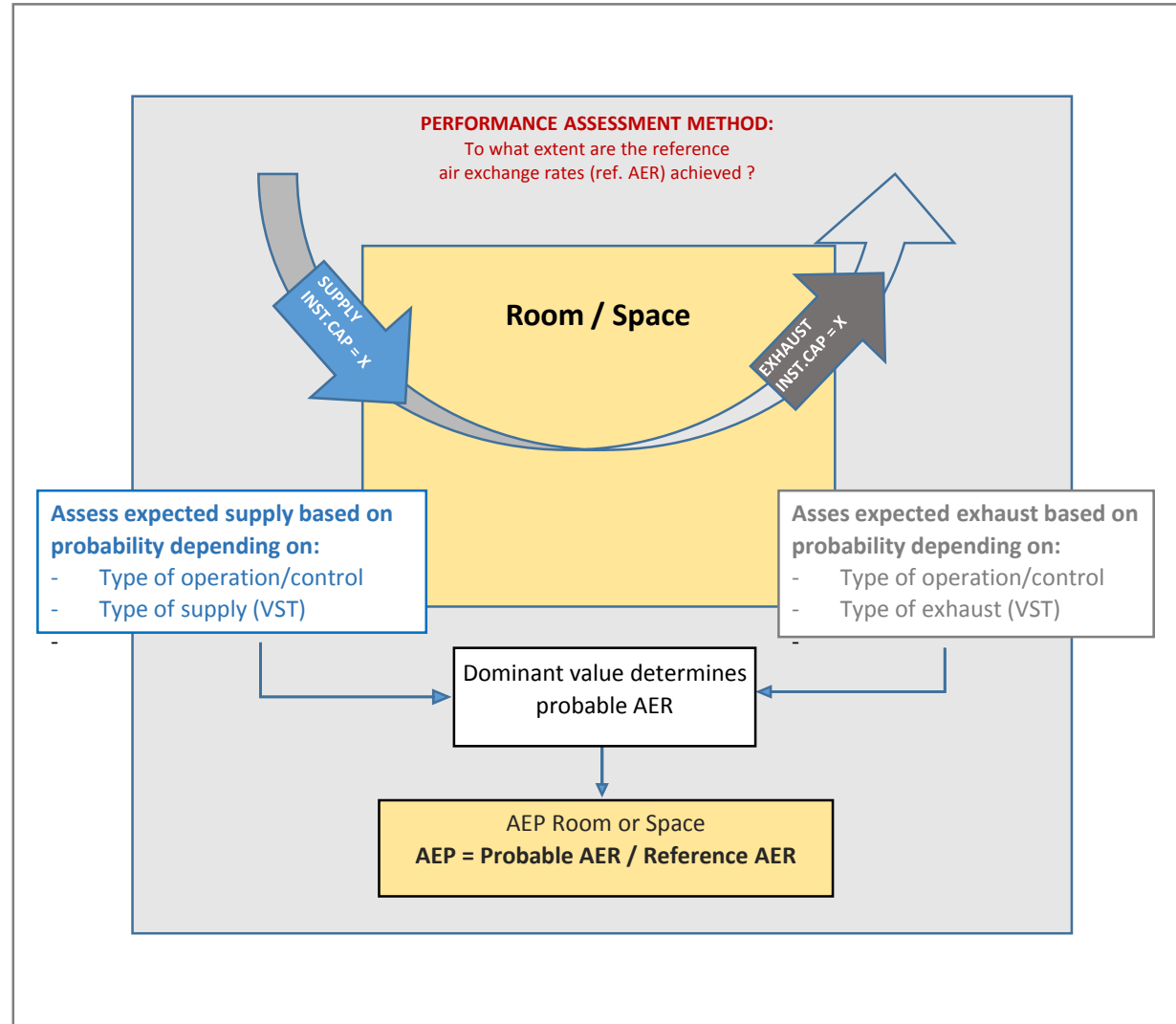
No. HS	Design extract airflow rates in l/s				
	kitchen	bathroom	other HS	if 1 toilet	if more toilets
1	20	10	10	10	10
2	25	10	10	10	10
3	30	15	10	10	10
4	35	15	10	15	10
≥ 5	40	15	10	15	10

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

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

1	HS	supply	Natural Direct Supply	NDS	$10^e Perc_{NDS} \cdot P_{windward/leeward}$
		exhaust	Natural Indirect Exhaust	NIE	$PCO_{NDS} \cdot P_{drs;HS} \cdot P_{inf}$
	ES	supply	Natural Indirect Supply	NIS	$P_{drs;ES}$
		exhaust	Natural Direct Exhaust	NDE	$10^e Perc_{NDS+NDE}$

OVERALL SCHEME



VENTILATION PERFORMANCE

A method for assessing the effectiveness of a ventilation system

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 **NEN** 1087 ;2019

Ventilation in building; Dutch determination method with focus on IAQ

Jelmer de Jong, Brink Climate Systems



- 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 automatically a good IAQ
- In 2017 a new determination method for ventilation is started; the NEN1087
- Parallel approach to the EVIA IAQ label

- 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:
 - Airtightness of the dwelling

VENTILATIE SYSTEEM TYPE VST6

VST4 : Mechanische afzuiging in natte ruimtes en verblijfsruimtes gecombineerd met mechanische toevoer in de verbindingsruimte(s)

VST6	NATTE RUIMTES (EXHAUST SPACES (ES))	VERBLIJFSRUIMTES (HABITABLE SPACES (HS))
TOEVOER VOORZIENINGEN	MIS	MIS
AFVOER VOORZIENINGEN	MDE	MDE

BRINK

INPUT

ALLEEN GELE CELLEN INVULLEN!

1 Geef karakteristieke lekdichtheid (qv10) van de woning in $\text{dm}^3/\text{m}^2/\text{s}$: qv10 0,50

2 Geef type en aantal van natte ruimtes (ES) en verblijfsruimtes (HS)

separate_keuken	badkamer	toilet	utility	ander	total ES
number	number	number	number	number	number
1	2	2	0	0	5

MDE in l/s 63,00

verblijfsruimtes	
number	total surface area in m^2
5	110,00

3 Geef type BVU

kies BVU-type 2 CENTR.BIDIR. VENT. UNIT | VARIABLE FLOWRATE | VARIABLE FLOWRATE RATIO BETWEEN SPACES

MINIMAAL TE INSTALLEEREN CAPACITEIT CONFORM BOUWBESLUIT in l/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

4 Specificeer te installeren MDE- capaciteit per type ES in l/s:

separate_keuken	badkamer	toilet	utility	ander	totaal MDE
44,00	21,00	7,00			100,00

Specificeer MDE-capaciteit HS:

verblijfsruimtes	
l/s/m^2	l/s
0,90	99,00

5 Specificeer gereduceerde MDE- capaciteit per type ES in l/s:

3,15	2,10	1,05			9,45
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Specificeer gereduceerde MDE-cap.

l/s/m^2	0,150	l/s	16,50
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6 Resulterende MDS cap. verbindingsruimte

max	116,50 l/s
min	25,95 l/s

Benodigde capaciteit MIS (overstroomvoorz.) ES als % van MDE conform BB

100%	100%	100%			100%
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Benod. capaciteit MIS HS als % van MDE conform BB

100%

7 Geef type regeling MDE vanuit ES:

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

Geef type regelingen HS:

MDE verblijfsruimtes	
% HS oppervl.	control type
100%	manual

OUTPUT

KANS DAT BB-CONFORM VENTILATIEDEBIET OP VERTREKNIVEAU OPTREEDT : AEP

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

AER WONING	dm^3/s	m^3/h	ach	$\text{dm}^3/\text{s/m}^2 A_{\text{tot}}$
totaal	50	179	0,75	0,32

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 manual control.

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