IAQ 2016 Defining Indoor Air Quality: Policy Standards and Best Practices

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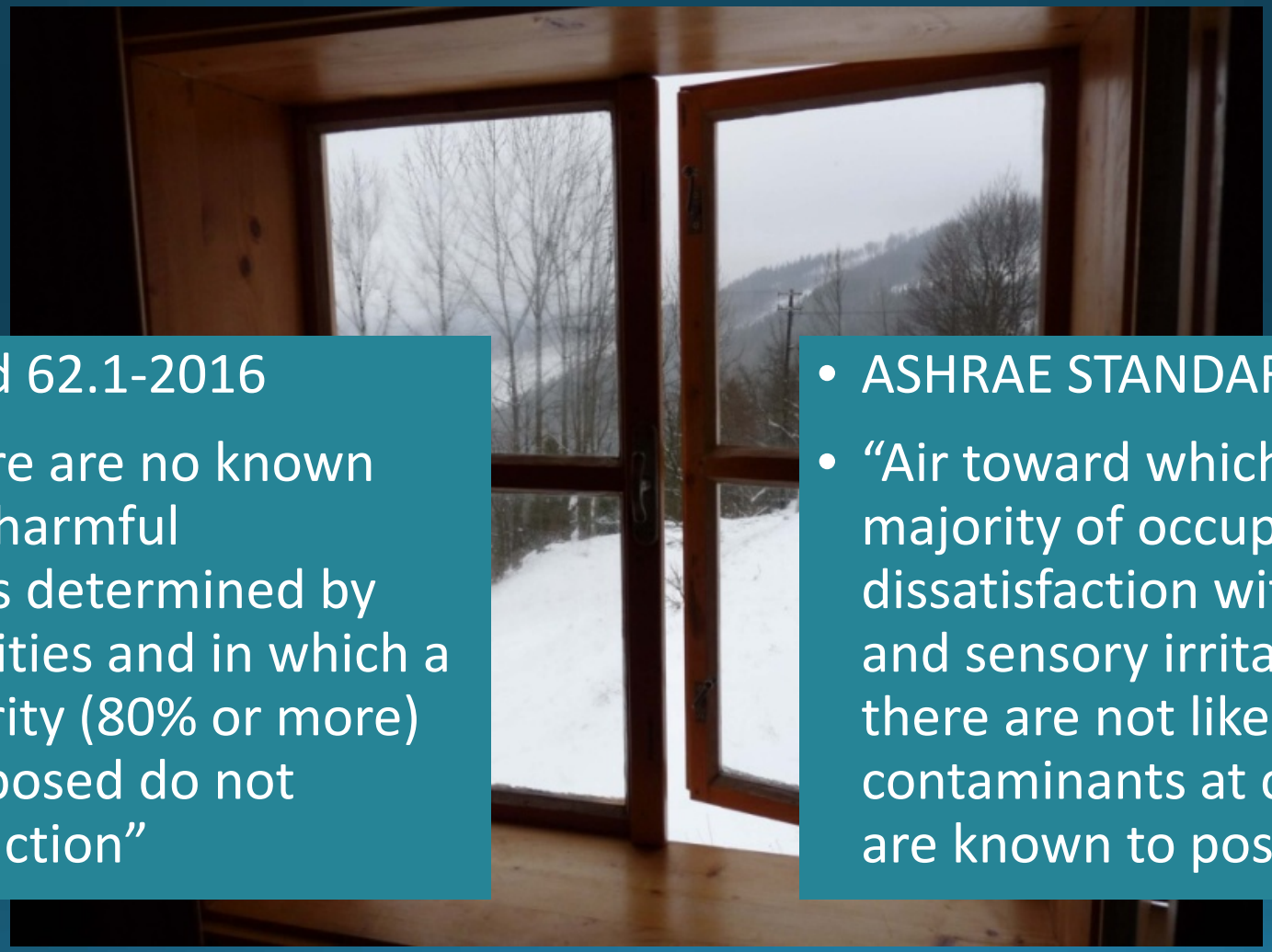
Design for “High Indoor Air Quality” in Residences – Current Status and Outlook for the Future

Annex 68 – Subtask 4

What is acceptable IAQ?



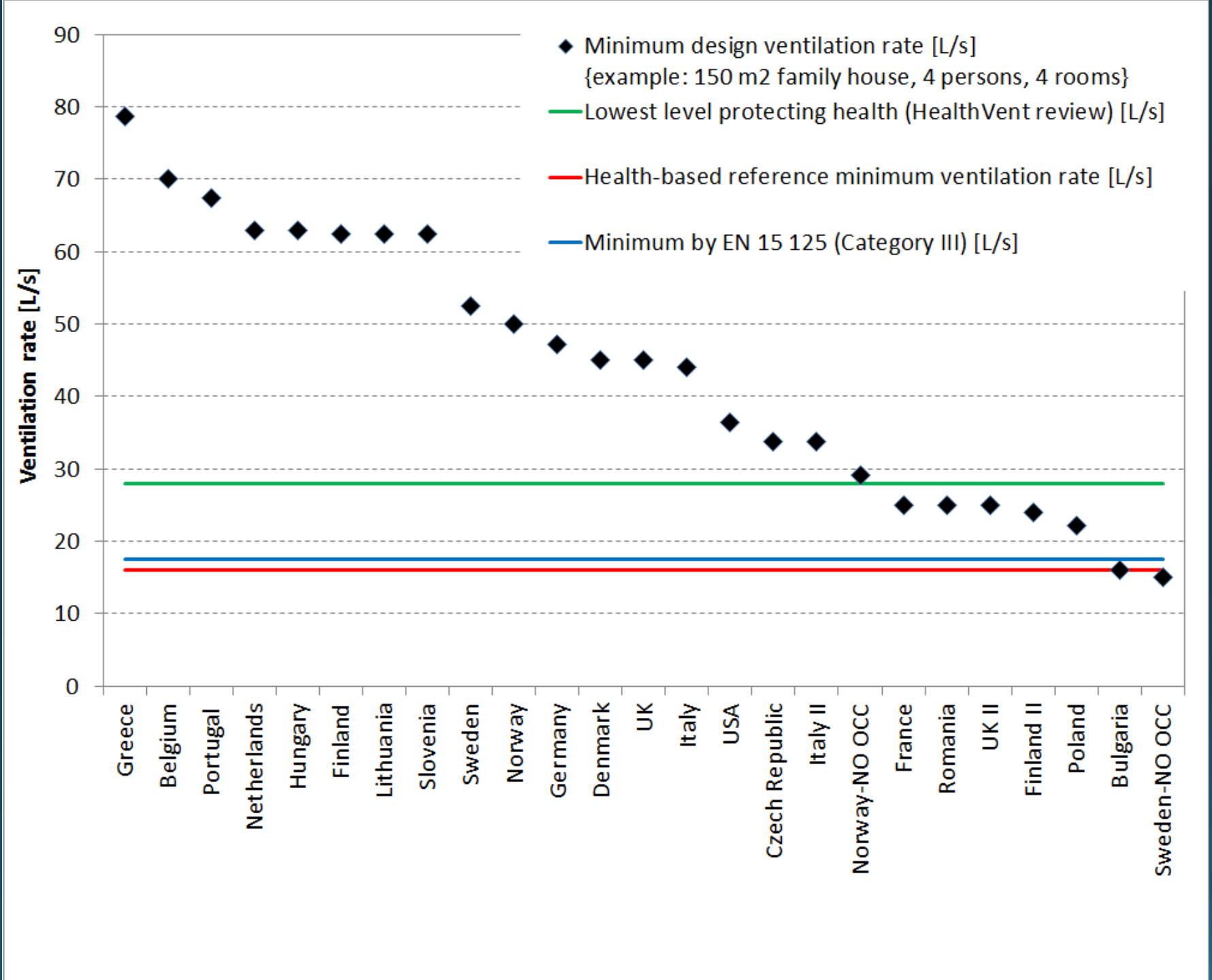
- ASHRAE Standard 62.1-2016
- “Air in which there are no known contaminants at harmful concentrations as determined by cognizant authorities and in which a substantial majority (80% or more) of the people exposed do not express dissatisfaction”

- ASHRAE STANDARD 62.2-2016
- “Air toward which a substantial majority of occupants express no dissatisfaction with respect to odor and sensory irritation and in which there are not likely to be contaminants at concentrations that are known to pose a health risk”

How should we ventilate today?

- International Standards & Guidelines – well known, but are not necessarily implemented in all countries
- National Building Codes – may/ should take standards into account (EU – EPBD etc.)
- Health based ventilation rates – the HealthVent project
- Many reports/review papers summarizing requirements:

  - Kunkel, S., Kontonasiou, E., et al. (2015) Indoor air quality, thermal comfort and daylight. Analysis of residential building regulations in eight EU member states, Buildings Performance Institute Europe (BPIE), ISBN: 9789491143106
  - Seppanen, O., et al. (2012) Work Package 5 - EXISTING BUILDINGS, BUILDING CODES, VENTILATION STANDARDS AND VENTILATION IN EUROPE, Final report, HealthVent, Contract No.: 2009 12 08
  - Dimitroulopoulou, C. (2012) Ventilation in European dwellings: A review, Building and Environment 47, pp.109 – 125
  - Chenari, B., Dias Carrilho, J., Gameiro Da Silva, M. (2016) Towards sustainable, energy-efficient and healthy ventilation strategies in buildings: A review, Renewable and Sustainable Energy Reviews 59, pp. 1426-1447
  - …..

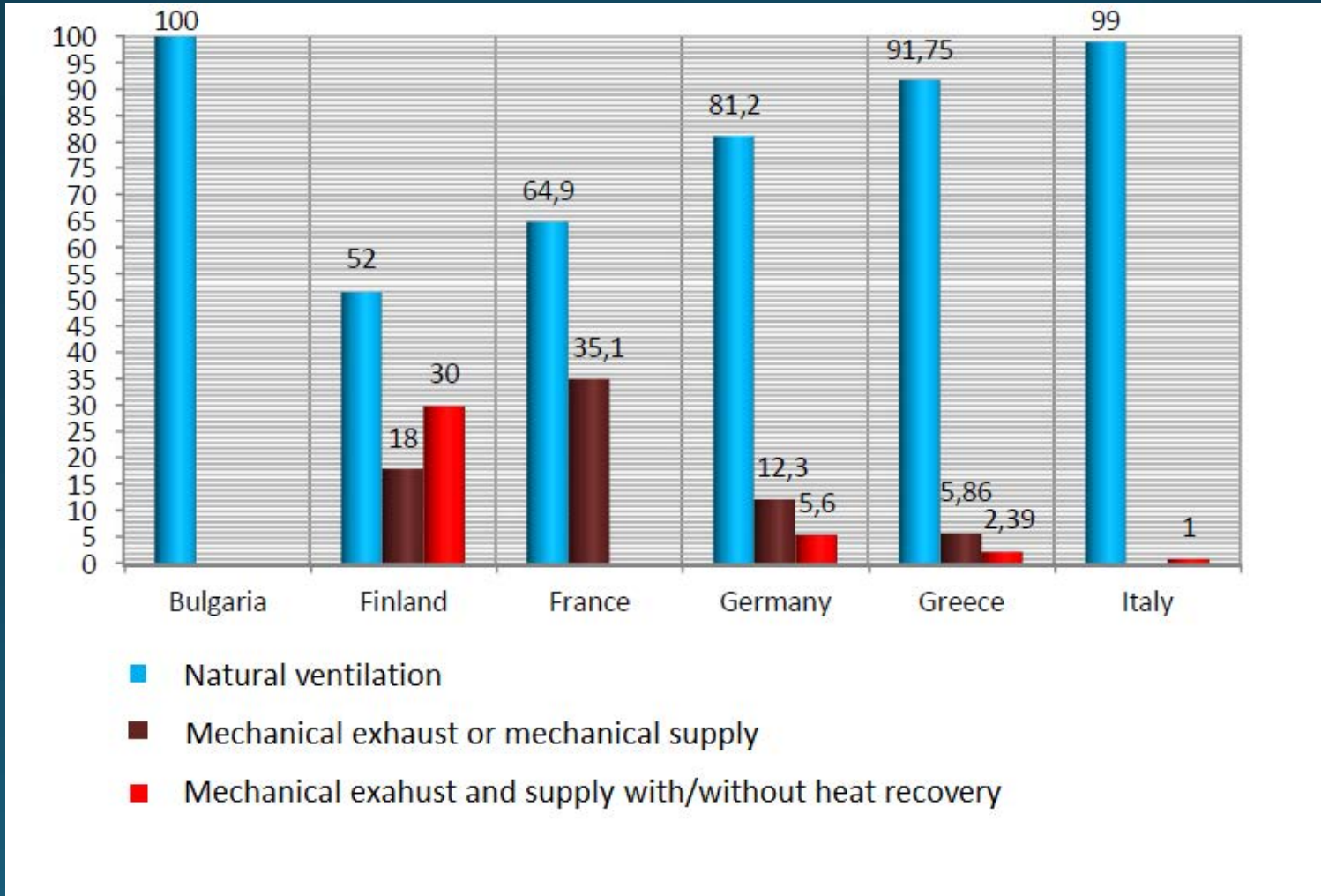

Minimum design ventilation rate [L/s]
{example: 150 m2 family house, 4 persons, 4 rooms}
Lowest level protecting health (HealthVent review) [L/s]
Health-based reference minimum ventilation rate [L/s]
Minimum by EN 15 125 (Category III) [L/s]
Ventilation rate [L/s]
90
80
70
60
50
40
30
20
10
0
Greece
Belgium
Portugal
Netherlands
Hungary
Finland
Lithuania
Slovenia
Sweden
Norway
Germany
Denmark
UK
Italy
USA
Czech Republic
Italy II
Norway-NO OCC
France
Romania
UK II
Finland II
Poland
Bulgaria
Sweden-NO OCC

How do we ventilate today?

- Thorough survey of ventilation systems in Europe by the HealthVent project in 2012
- Combined with results from the TABULA – building typology project (data up to 2010)
- Results=>
  - Most of the buildings were still naturally ventilated
  - Highest NV share in southern Europe (up to 100%)
  - Mechanical ventilation is dominating in northern Europe (93% of Finnish buildings built after 2004 have mechanical supply/exhaust)
  - Large differences among countries despite the EU

How do we ventilate today?

- Ventilation systems in single family houses – comparison of % for total building stock; figure from: Seppanen et al. (2012)



How do we ventilate today?

- New analysis of the TABULA database – typical ventilation systems for single family houses and multifamily dwellings
- Typical systems in 2009-2012; now ~2015; future/ambitious projects

- *NV – Natural Ventilation; MVHR – Mechanical Ventilation with Heat Recovery; MEV – Mechanical exhaust ventilation; MSV – Mechanical Supply Ventilation*

Country	Single Family Houses			Multi Family Buildings		
	2009-2012	State of the art	Ambitious systems/next future	2009-2012	State of the art	Ambitious systems/next future
Belgium	MEV	MVHR	MVHR	MEV	MVHR	MVHR
Bulgaria	NV	NV	NV	NV	NV	NV
Czech Republic	NV	NV	MVHR	NV	NV	MVHR
Denmark	NV	MVHR	MVHR	NV	MVHR	MVHR
France	MEV	MEV	MVHR	MEV	MEV	MVHR
Germany	MEV	MVHR	MVHR	MEV	MEV	MVHR
Italy	NV	NV	MVHR	NV	NV	MVHR
Netherlands	MEV	MVHR	MVHR	MEV	MVHR	MVHR
Norway	MVHR	MVHR	MVHR	MVHR	MVHR	MVHR
Slovenia	NV	NV	NV	NV	NV	MVHR
UK	NV	NV	NV	NV	NV	NV

Annex 68: Subtask 4 - Strategies for design and control of buildings

Energy in Buildings and Communities Programme

Objective of the subtask:

- Apply the results of previous subtasks together with existing knowledge to devise optimal and practically applicable design and control strategies for high IAQ in residential buildings.

We should account for:

- Requirements for IAQ (current standards & new metrics)
- Systems/air supply modes/building types

=> How much do we need to ventilate?

=> How do we design the system?

Subtask 4 - Strategies for design and control of buildings

- **Structure - activities**

Activity 4.1
State of the art – written knowledge & stakeholder survey

How do we design/operate ”air quality”/ventilation today?

Activity 4.2
Investigation of possible design strategies

Do we need to change current strategies to apply Annex68 results? How?

Activity 4.3
Investigation of possible operational strategies

Activity 4.4
Preparation of an Annex 68 guide

Future outlook - discussion

- Application of emission databases in practice to better account for “what can be in the air” => ventilation rates based on target exposures?
- Using dynamic simulation for design to explore influence of control on air quality?
- Using new sensors (MOS VOC, etc.) for Demand Control?
- Strategies for operation – commissioning, education of users, operational diagnostics, …. ?

Questions?

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