REHVA

Technology and Research Committee

Friday 25 January, 09:00-11:00

REHVA Workshops in CLIMA 2019

1. REHVA-ISIAQ-ASHRAE workshop on evidence-based ventilation needs and development process of future standards
2. REHVA-SHASE workshop on NZEB concepts in Europe and Japan
3. REHVA-eu.bac workshop “From preventative to predictive maintenance of building systems using BACS”
4. REHVA-EPB Center workshop on EPB standards

REHVA-ISIAQ-ASHRAE workshop on evidence-based ventilation needs and development process of future standards

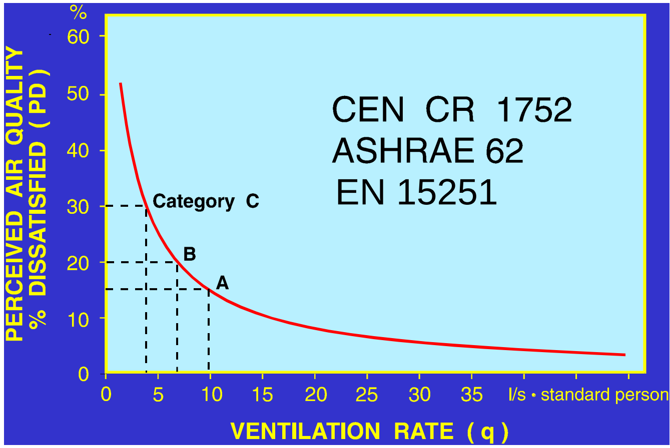
Objective: To discuss recent research findings and actions needed to establish evidence-based design criteria to be implemented in future standards.

Background:

- Some attempts have been made to define health based ventilation rates (instead of comfort/PAQ approach)
- Ventilation is somehow addressed in revised EPBD
- Some new evidence is available on isolated bioeffluents

Existing evidence on ventilation need

- Body odor/bioeffluents/perceived air quality 4, 7 and 10 L/s pers (CR 1752:1998)
- 0.5 ach in Nordic countries associated with house dust mites (Wargocki et al. 2002)
- No effects on asthma and allergy when ≥0.37 ach (**7 L/s pers**) or **CO_2 ≤900** ppm above outdoors (≈1250 total) (Bornehag et al. 2005)



- **Mechanical ventilation** system reduced allergic symptoms and asthma and RH (Kovesi et al. 2009, Xu et al. 2010, Wright et al. 2009)
- Reduction of ventilation rate from 0.5-0.8 ach to 0.4-0.5 ach **did not have negative effect on SBS symptoms, but air was perceived as stuffy/poor** (Engvall et al. 2005)
- **CO_2 1600 ppm (total)** no effects on acute health symptoms and mental performance (experiments to isolate bioeffluents, Zhang et al. 2018)

From evidence to ventilation design

- Health based ventilation rate **4 L/s pers** recommended for the condition in which the only source of pollution are human occupation emitting bio-effluents (Carrer et al. 2018, HealthVent project)
- 6-7 L/s pers (summary by Carrer et al. 2015) should apply in occupied rooms (bedrooms, living rooms), but the same amount of extract air is needed from wet rooms and kitchen (source control)
- Default occupancy and transfer air assumptions to be applied to end up with room based supply and extract airflow rates
- Selection of air flow rates in dwellings has recently been updated in European and ISO standards (EN 15251, prEN 16798-1, ISO 17772-1:2017)
- Further developed in REHVA GB 25 to be suitable for practical design

REHVA GB 25 (2018) Challenge of silent, clean and draft-free energy efficient ventilation

- Ventilation need – selection of airflow rates
- Ventilation system sizing – pressure drop and noise calculations
- Selection of ventilation units
- Ventilation system layouts:
  - New buildings
  - Renovation
- Commissioning and balancing
- Maintenance

Air flow rate sizing in REHVA GB 25

- Based on 7 L/s pers, common occupancy density and rooms default assumptions
- Transfer air from bedrooms accounted

	Supply airflowrate L/s	Extract airflowrate L/s	Air velocity[1] m/s
Living rooms[2] >15 m^2	8+0.27 L/(s m^2)		0.10
Bedrooms >15 m^2	14		0.10
Living rooms and bedrooms 11-15 m^2	12		0.10
Bedrooms <11 m^2, 3rd and the following bedrooms in large apartments	8		0.10
WC		10	
Bathroom		15	
Bathroom in one room apartement		10	
Utility room		8	
Wardrobe and storage room		6	
Kitchen[3]		8	
Kitchen[3], one room apartement		6	
Kitchen, cooker hood in operation		25	
Average airflowrate of a whole residence L/(s m^2)	0.42		
Staircase of an apartement building, ACH	0.5		

[1]Maximum air velocity values apply at design airflow rate and supply air temperature in heating season conditions, in boost mode higher velocities may be accepted, see section 2.2.
[2]Transfer air from bedrooms may be reduced, 12 L/s is the minimum value
[3]Airflow rate in the kitchen when cooker hood is not in operation

Demand controlled residential ventilation

- Demand controlled ventilation (DCV) in offices can often save 40% of energy (e.g. 33–41% reported in Ahmed et al. 2015)
- Occupancy difference: 0.4 L/s m^2 in homes vs. 2 L/s m^2 in offices - by factor 5 difference in ventilation
- REHVA GB 25 recommends continuous operation for residential ventilation as a robust and reliable solution but many technical solutions are available for demand-controlled ventilation
- DCV needs to be controlled in addition to bioeffluents and humidity generation also by other emission sources (VOC etc.) which do exist all the time
  - when these sources are taken into account much longer ventilation operation is needed compared to simple CO_2 control.
  - Walker and Brennan (2008) have shown that only the saving in between 0-8% can be achieved depending on occupancy pattern and climate.

WS tentative program:

- Recent evidence on health and mental performance, Pawel Wargocki
- Performance criteria in ISO and EN stadnards, Bjarne Olesen
- ASHRAE 62 approach, William Bahnfleth
- From performance criteria to design values, an example of residential ventilation, Jarek Kurnitski

REHVA-SHASE workshop on NZEB concepts in Europe and Japan

- Objective: To provide an overview of recent developments and possibilities to benchmark NZEB performance levels in different climates and countries. To discuss what would be needed to set up a common energy performance scale for European or global EPC.

REHVA-SHASE workshop on NZEB concepts in Europe and Japan

WS tentative program:

- ZEB current activities Dr. Niwa
- ZEB Best practices, 1or 2 spearkers from Japan
- How to benchmark energy performance levels in different climates, Martin Thalfeldt
- Output of co-research REHVA & SHASE.J Dr. Yoon