

## Can we rely on good ventilation? *IAQ and ventilation effectiveness*

Presented by Ian Mawditt

February 2017  
London



The scientific literature, I have found, suggests that ventilation does not entirely remove pollutants; many are persistent

**SOURCE CONTROL** is the answer - adopting the precautionary principle



**The Precautionary Principle**

The industry has tried to convince us that materials are not much of a problem and we only need mechanical ventilation

THE FUTURE OF  
**INDOOR AIR QUALITY  
IN UK HOMES**  
AND ITS  
**IMPACT ON HEALTH**

PREPARED BY  
PROF HAZIM B. AWBI  
SCHOOL OF BUILT ENVIRONMENT  
UNIVERSITY OF READING

ON BEHALF OF  


SEPTEMBER 2015



MY HEALTH  MY HOME

Did you know..?

**81%**

81% of people are at risk of suffering from a respiratory or dermatological condition because of poor air quality inside their home.

Your Health  
The quality of air in your home may affect your health

The Future of Indoor Air Quality in UK Homes

You are here: Home / Ventilation / **BEAMA LAUNCH CAMPAIGN FOR 'HEALTHY HOME MARK'**

★ **VENTILATION**  
**BEAMA LAUNCH CAMPAIGN FOR 'HEALTHY HOME MARK'**  
8 June 2015 By *HPM Magazine*

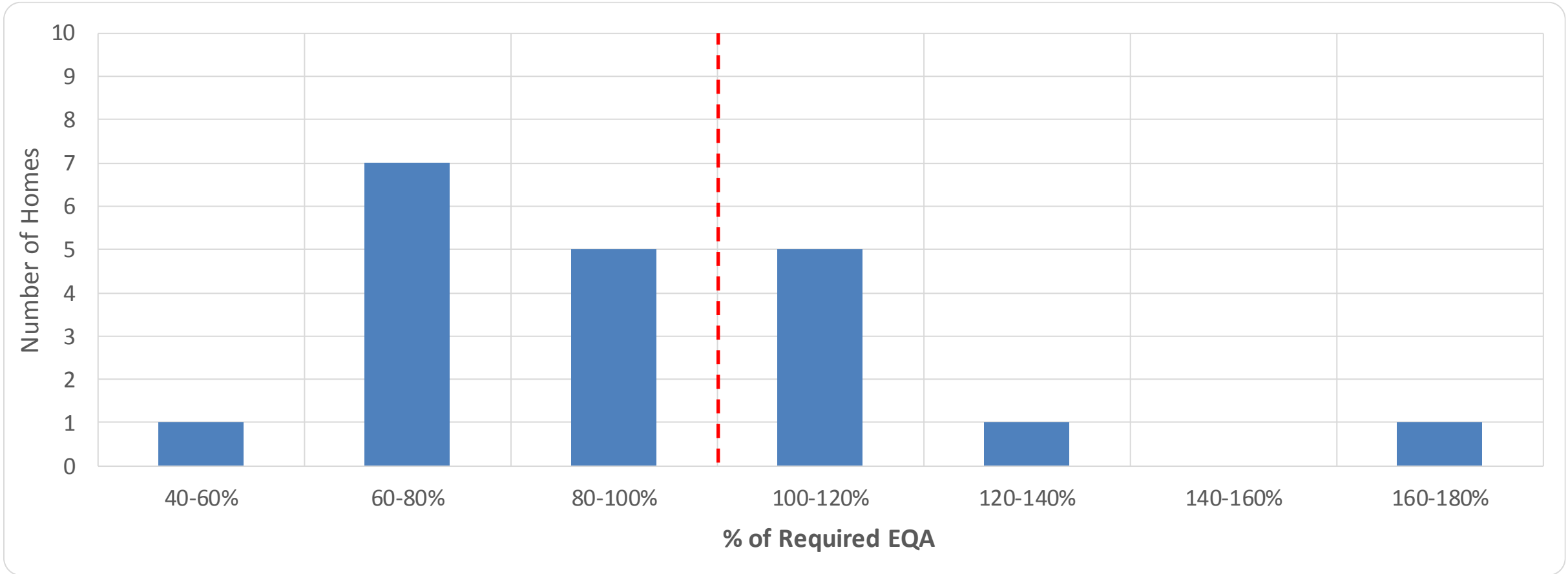


Slide from Tom Woolley presentation, October 2016

# Contents

- Ventilation performance summary – how are we doing?
- Ventilation effectiveness overview – results from field monitoring:
  - House Dust Mites
  - Carbon Dioxide
  - TVOCs
  - Nitrogen Dioxide
  - Radon
- Summary – can we rely on good ventilation?

# Installed ventilator area vs. AD F minimum specification



# Ventilation extract rates in new homes: continuous MEV

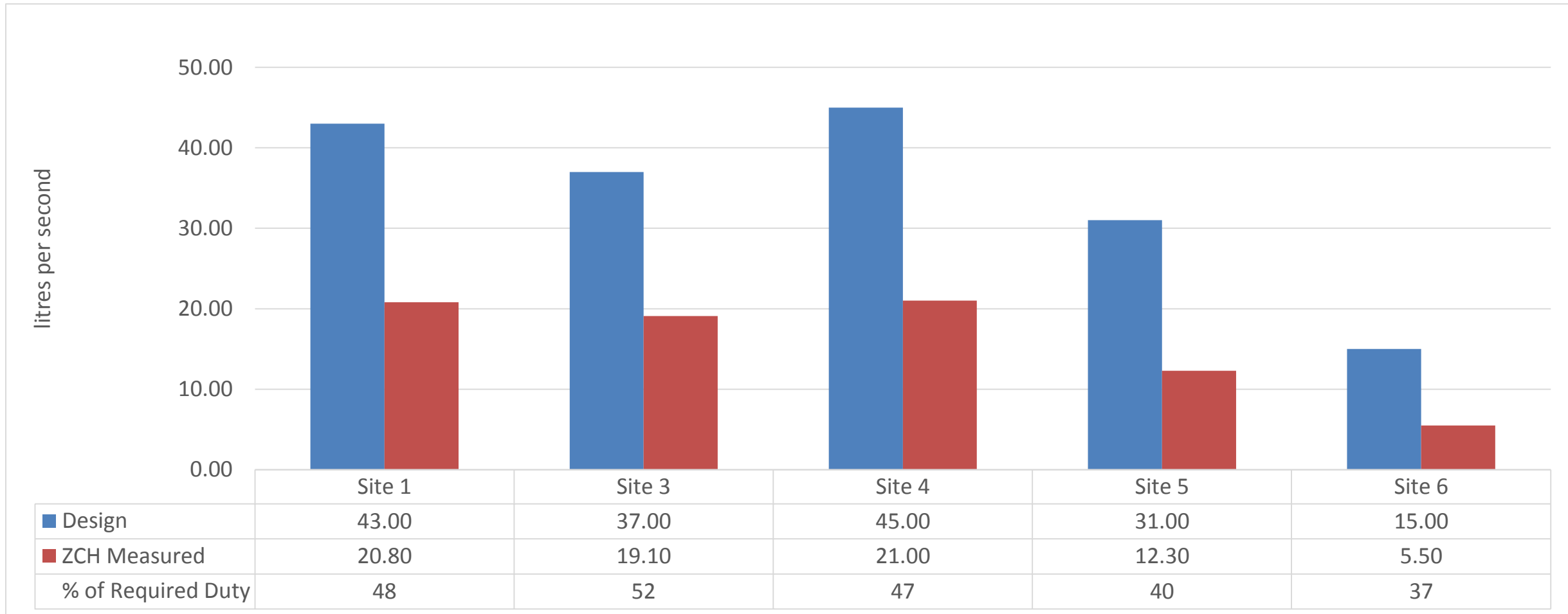
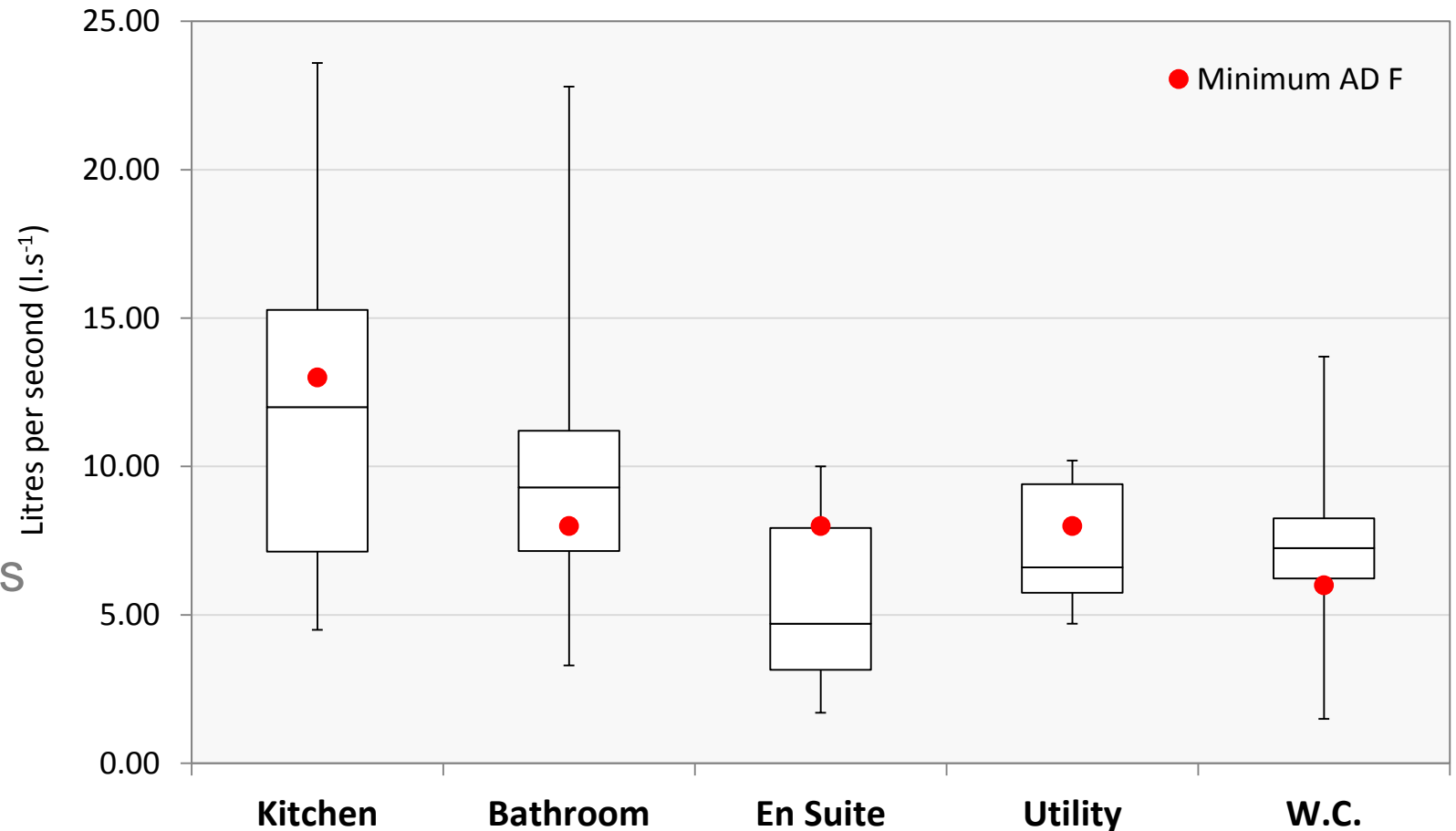


Chart for Zero Carbon Hub: *Ventilation in New Homes* study

# Measured flow rates – MVHR

- Minimum boost rate met in:
  - 44% kitchens
  - 71% bathrooms
  - 30% en-suites
  - 38% utility rooms
- Minimum supply air flow rates met in 33% of dwellings



Successful ventilation installation requires a full house of happy faces!

One unhappy face in the chain (row) will likely result in failure.

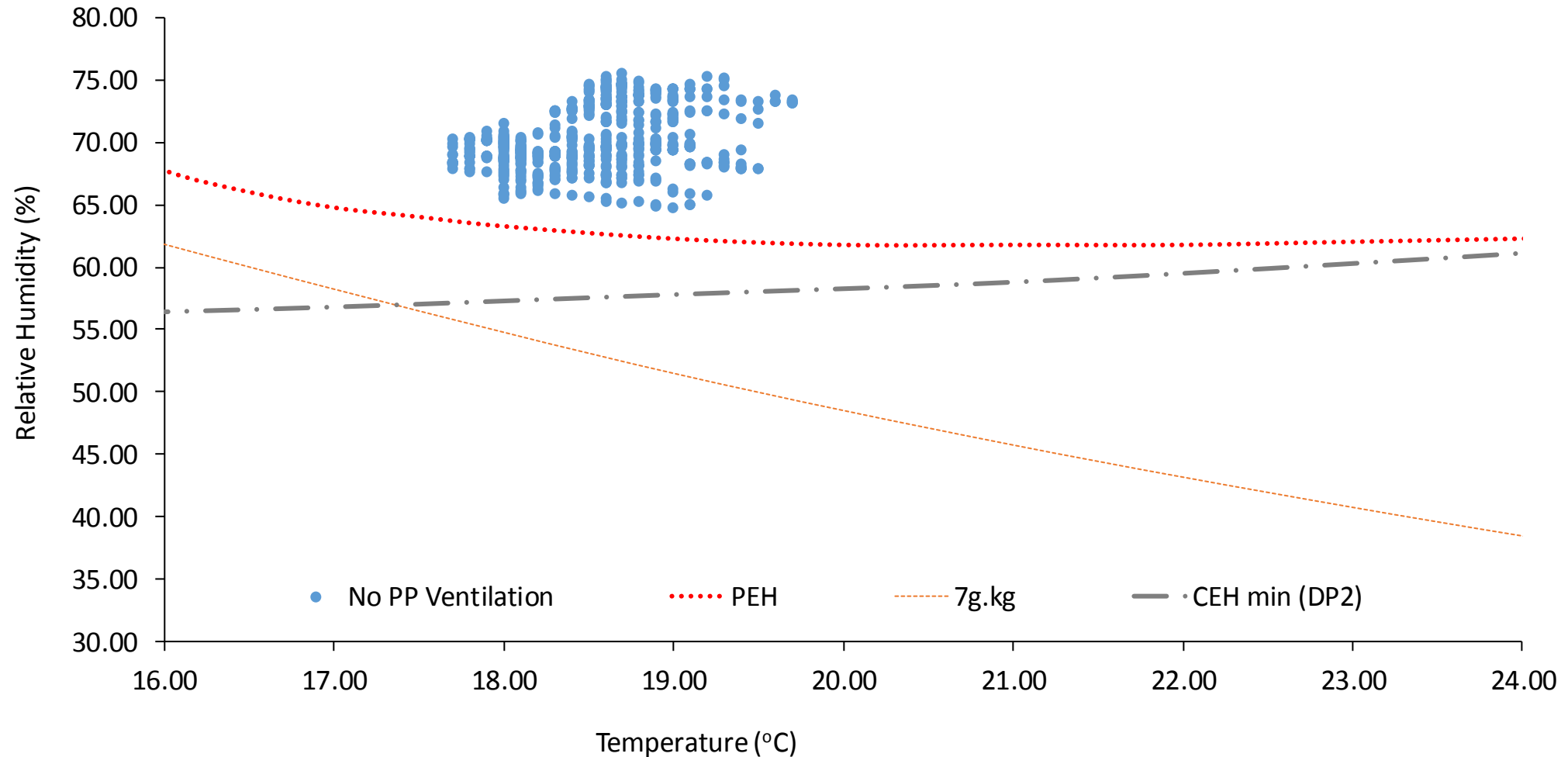
None of the sites visited in this study had a complete row of happy faces.

None of the ventilation systems met the minimum requirements specified in AD F

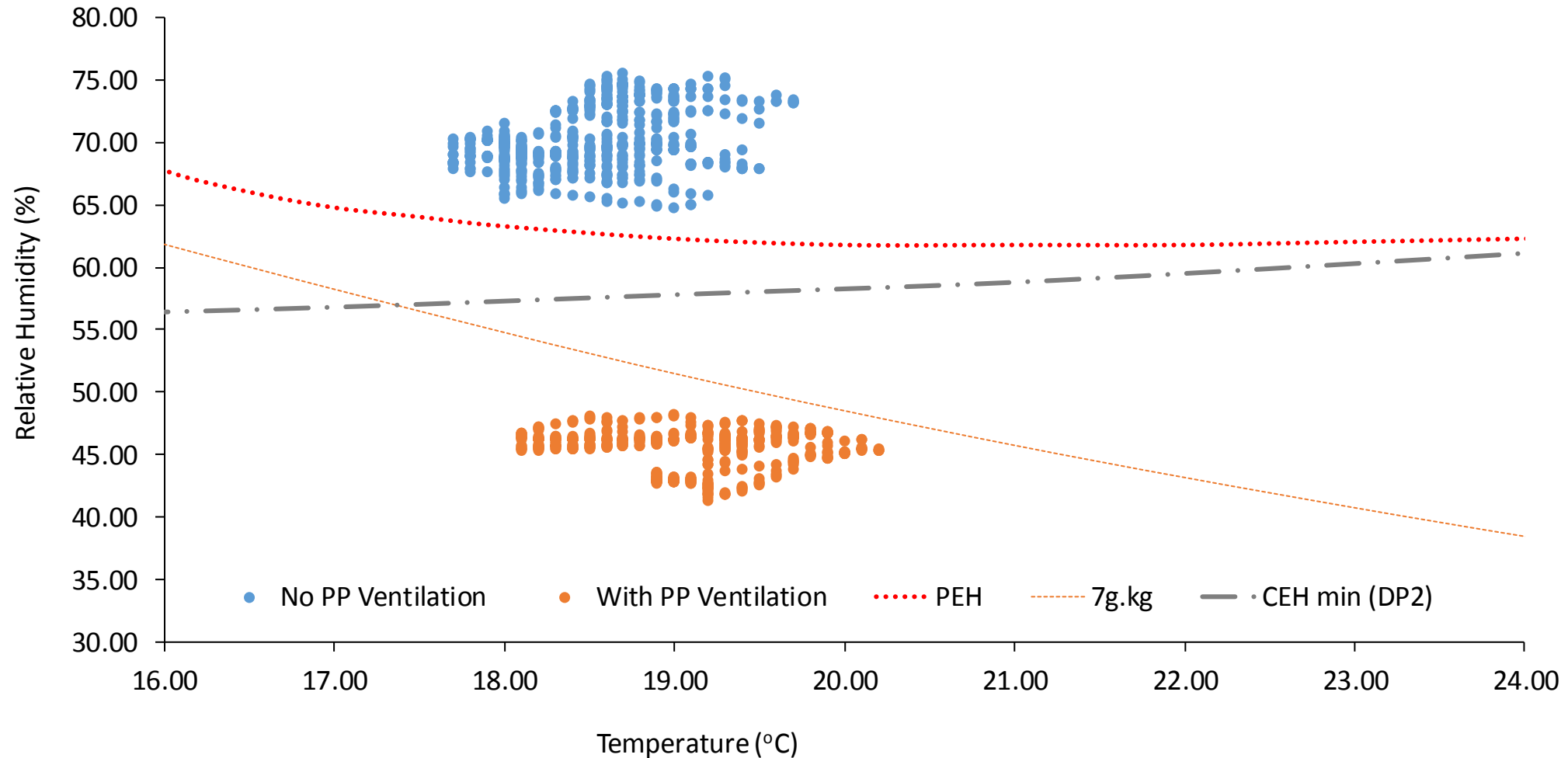
	Process	Design	SAP Assessment	Installation	Trickle vents	Door undercuts	Commissioning	Controls	Handover/operation
Site 1	😊	😞	😊	😊	😞	😞	😞	😞	😊
Site 2	😊	😊	😞	😊	😊	😊	😊	😞	😞
Site 3	😊	😊	😊	😞	😞	😞	😞	😞	😞
Site 4	😊	😊	😊	😊	😊	😞	😞	😞	-
Site 5	😞	😊	😊	😞	😞	😞	😞	😞	😞
Site 6	😊	😊	😊	😞	😊	😞	😞	😊	😊



# Hygrothermal conditions without purpose-provided ventilation



# Hygrothermal conditions with purpose-provided ventilation



# Seasonal performance – MVHR and non-MVHR

- CO<sub>2</sub> data from 43 monitored homes
- CO<sub>2</sub> levels higher in non-MVHR dwellings through spring and summer
- Increasing CO<sub>2</sub> levels in MVHR dwellings in summer may indicate shift toward natural vent during warmer periods

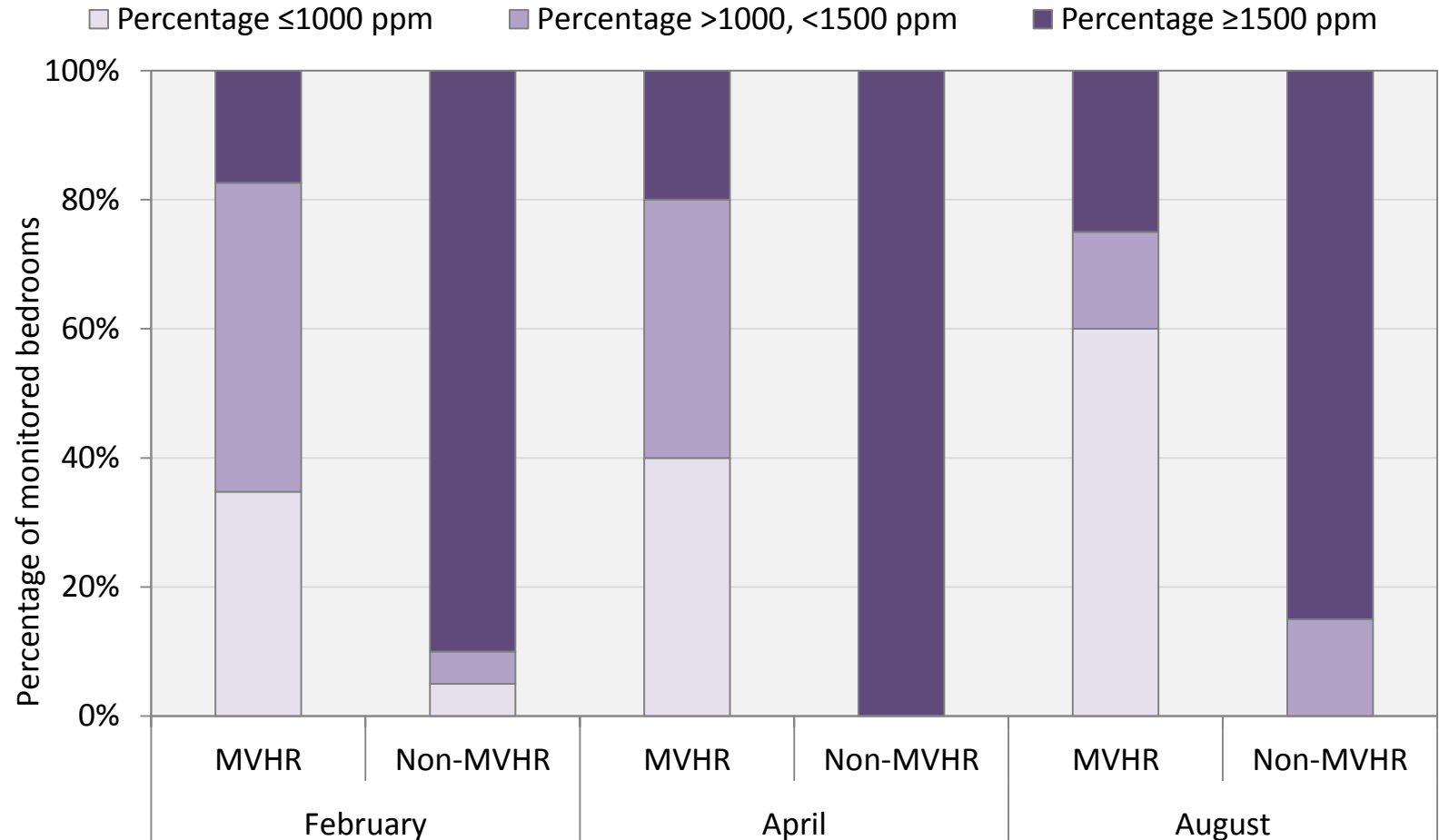
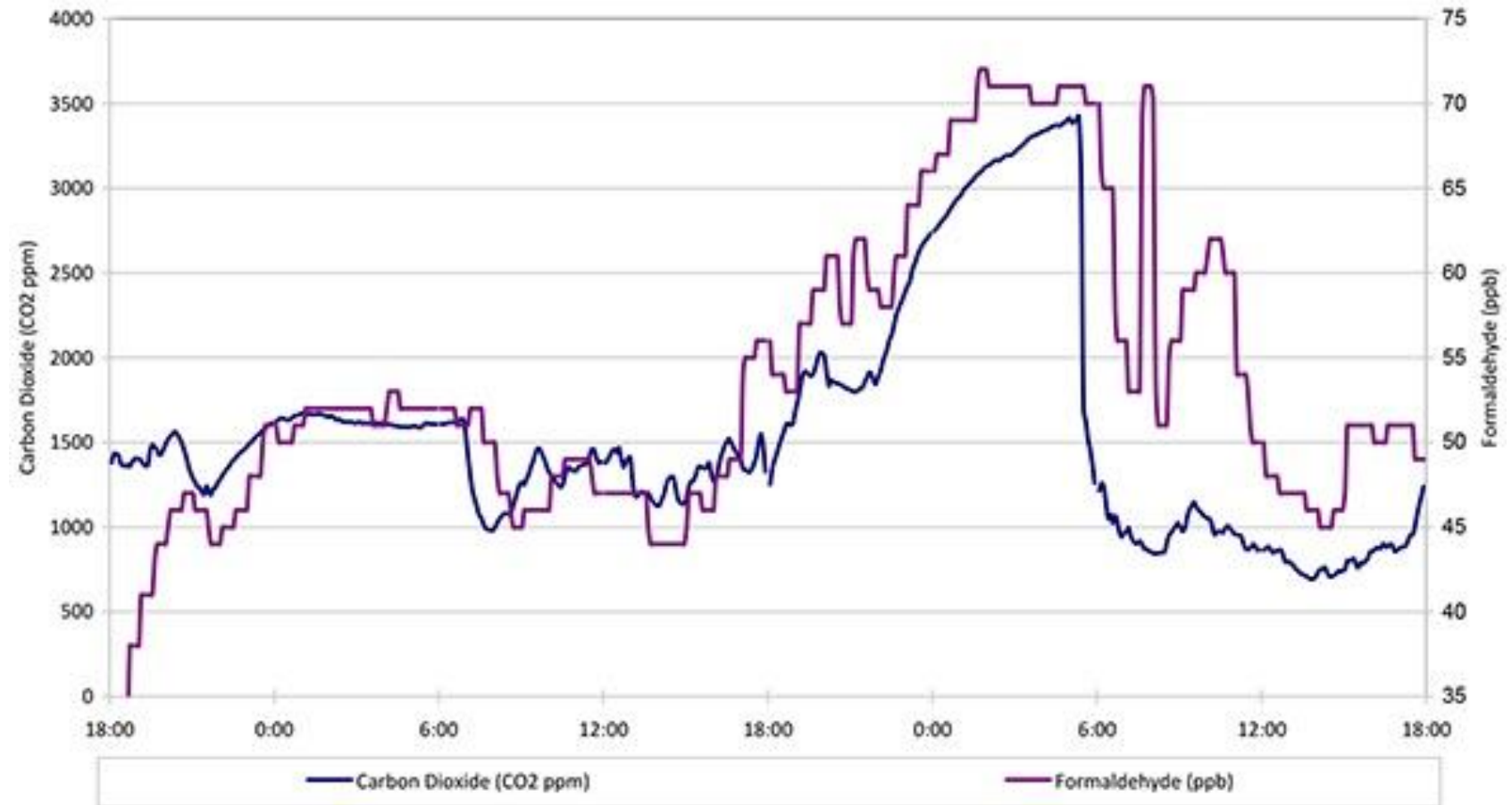


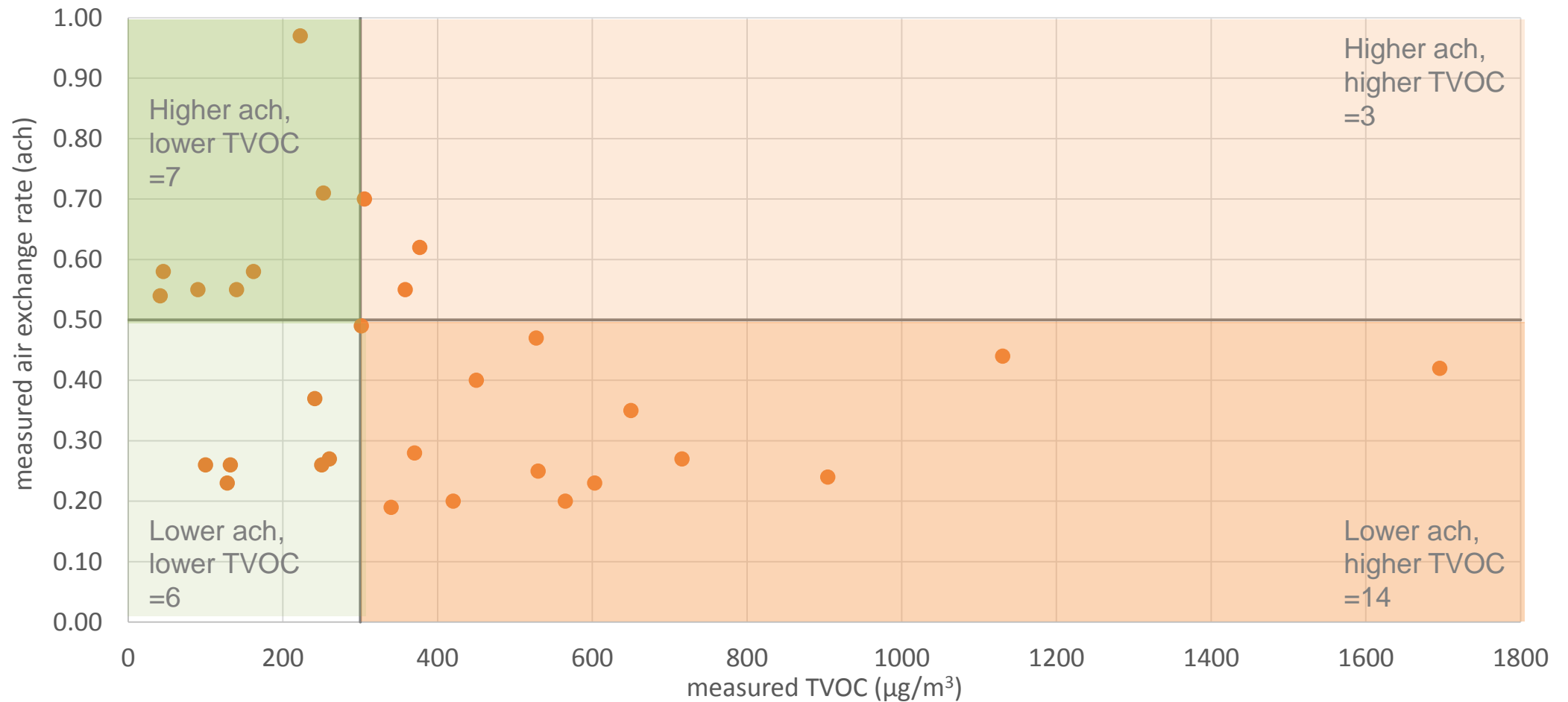
Chart from Characteristics and performance of MVHR systems (meta study): MEARU/OISD/Four Walls

# CO<sub>2</sub> concentration – a useful metric?

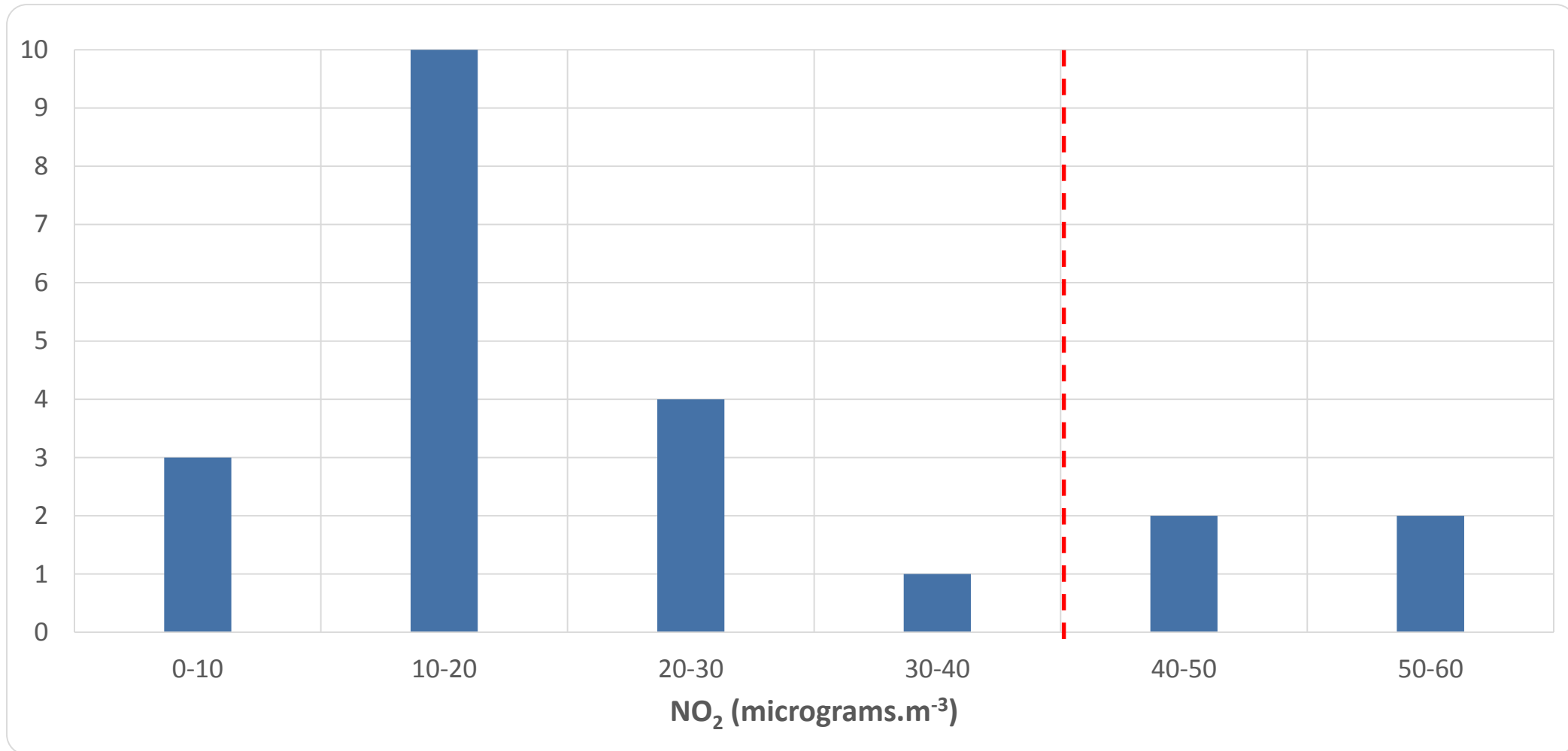
- CO<sub>2</sub> – is not harmful below 5000ppm, but it can keep bad company.
- CO<sub>2</sub> is a useful indicator for ventilation effectiveness
- Correlations can be found with CO<sub>2</sub> and chemical pollutants
- Formaldehyde is a human carcinogen



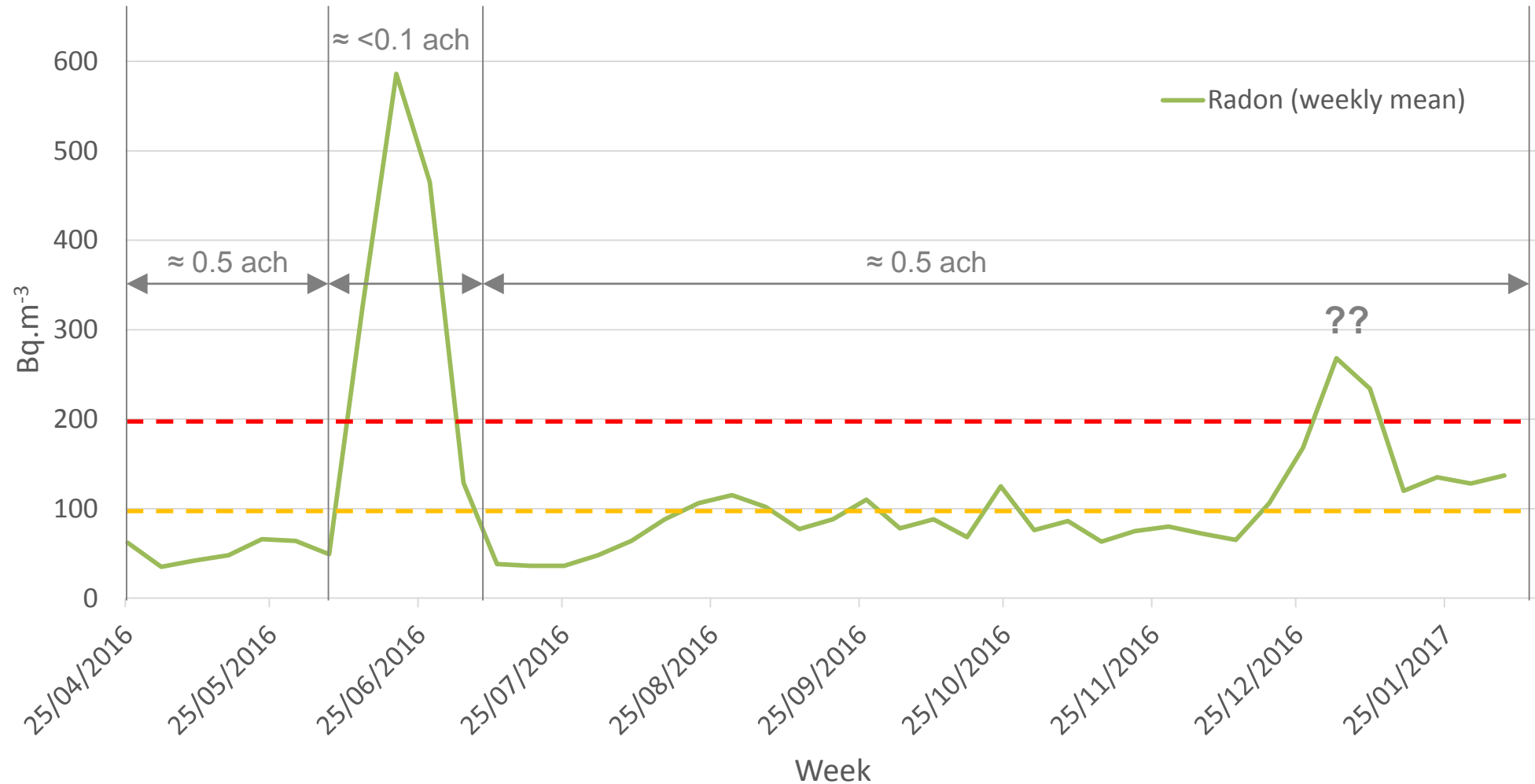
# Air exchange rates and TVOC concentrations in 30 bedrooms



# Dilution of combustion by-products



# Managing Radon – can we rely on ventilation?



## Summary – Can we rely on good ventilation?

- We know there are significant performance issues with domestic ventilation installations.
- But, moving some air is still better than allowing it to stagnate and become polluted – particularly the more airtight the building.
- Source control is important: building occupants have little or no control over background levels related to construction materials.

*Design for low emission is a priority*

*At <8 l/s/p source control becomes more important: AD F is based on  $\approx 3.5$  l/s/p*

*Moisture and bio-effluents are key pollutants in domestic environments*

- Can we rely on ventilation?...

*Well, not entirely (at domestic rates). But we do need to ventilate, so it had better be good!*



## And finally...

- Context is everything. E.g.:

*What are you ventilating for – activities?*

*What is the building's geometry/exposure/airtightness?*

*Is it in a Radon risk area?*

*How do (or will) occupants use the ventilation (including window use)?*

*What are the occupancy patterns and how does this relate to pollutants?*

*Risk relates to period of exposure and concentration of pollutant(s)*

*Etc., etc., etc....*

- We don't need to answer these to demonstrate Part F compliance. But we should be asking when we determine appropriate ventilation strategies.
- Ventilation should not be seen as an add-on – it is essential for safety.

Thank you  
[ian@fourwalls-uk.com](mailto:ian@fourwalls-uk.com)