

WG: Occupant and appliances heat gain

Status Report (18-5-2020)

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Overview of methods

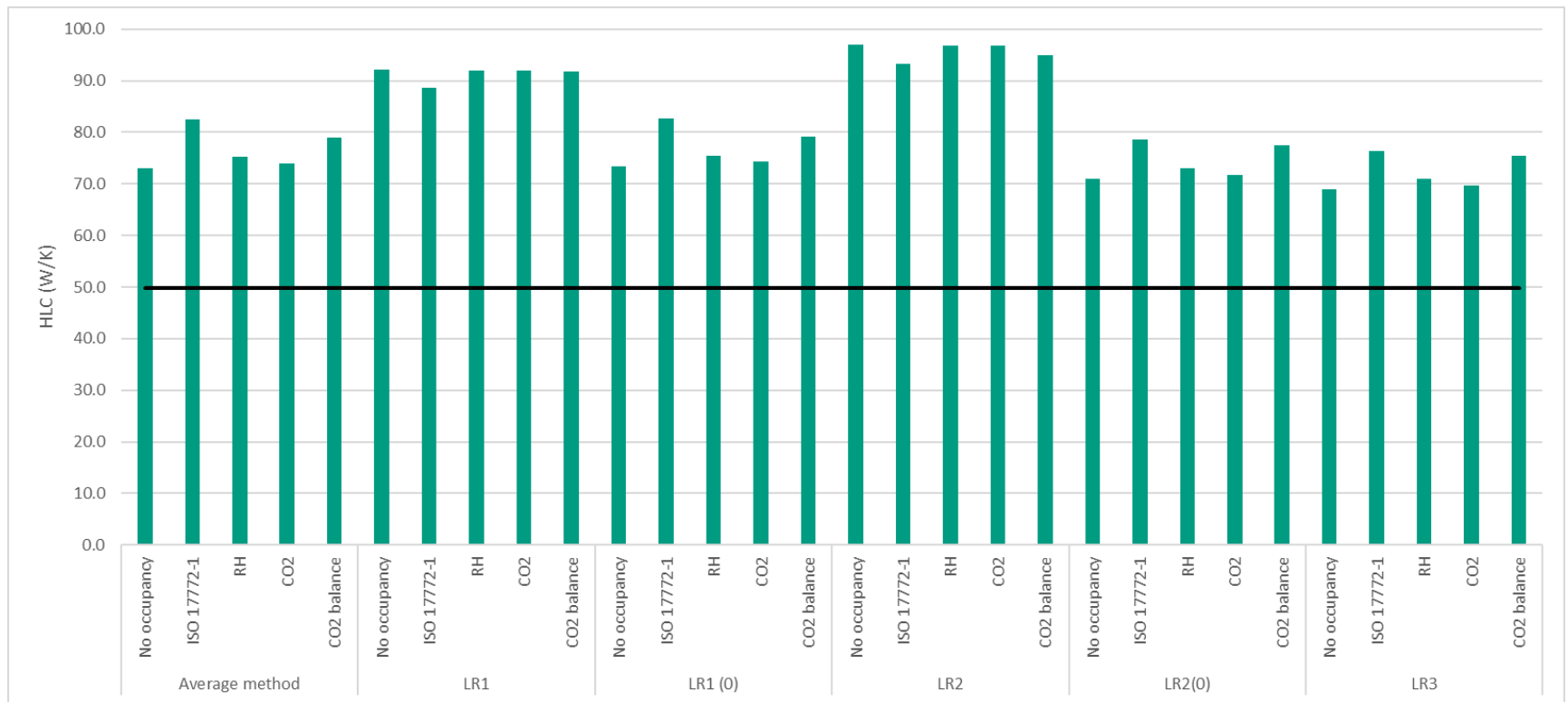
- I. Using standardized occupancy profiles from the ISO 17772-1 standard.
- II. Using measurements of relative humidity (RH) to determine presence.
(i) Conversion to AH, (ii) detection algorithm, (iii) multiply with standardized metabolic heat rates
- III. Using measurements of CO₂ to determine presence.
(i) Conversion to mg m⁻³, (ii) detection algorithm, (iii) multiply with standardized metabolic heat rates
- IV. Estimating the metabolic heat input using a CO₂ balance.
(i) Conversion to mg m⁻³, (ii) CO₂ balance to derive number of occupants, (iii) multiply with standardized metabolic heat rates

Datasets

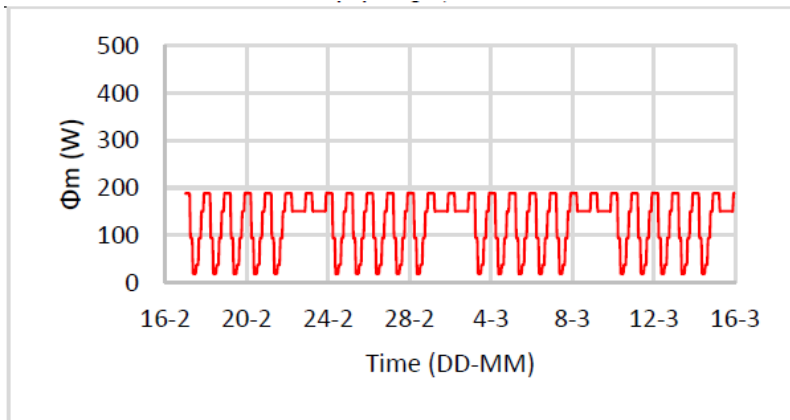
Gainsborough	17-02-2014 – 15-03-2014
Indoor temperature (Θ_i)	Lounge
Outdoor temperature (Θ_e)	Outdoor
Heat input	$\Phi_{\text{gas, SH}} + \Phi_{\text{electricity}} + \Phi_m$
Solar gains	$gA (3.6) \times I_{\text{glo}}$

Ukkel	05-01-2016 – 04-02-2016
Indoor temperature (Θ_i)	Arithmetic mean of guestroom, bathroom and living room
Outdoor temperature (Θ_e)	Outdoor (IRM)
Heat input	$\Phi_{\text{gas, SH}} + \Phi_{\text{electricity}} + \Phi_m$
Solar gains	$gA (5.9) \times I_{\text{glo}}$

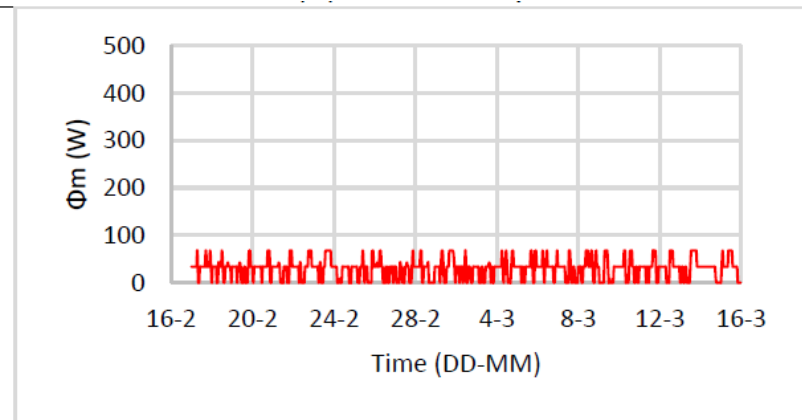
Results: Gainsborough



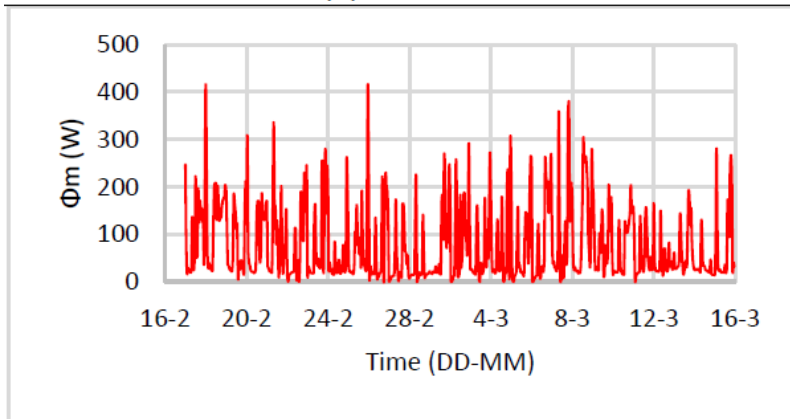
Results: Gainsborough



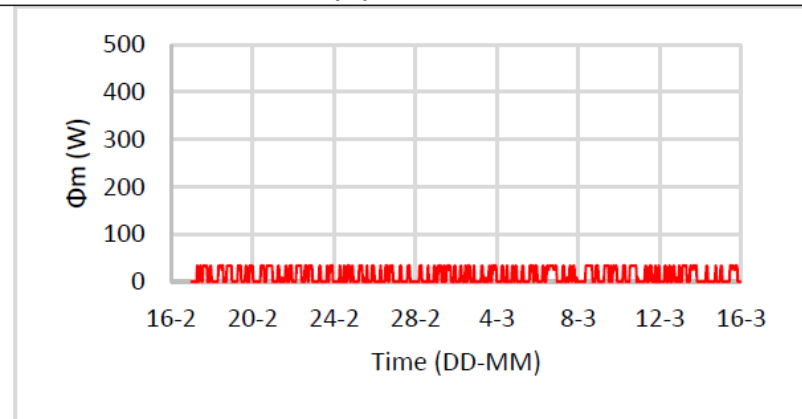
(c) Φ_m ISO



(d) Φ_m RH

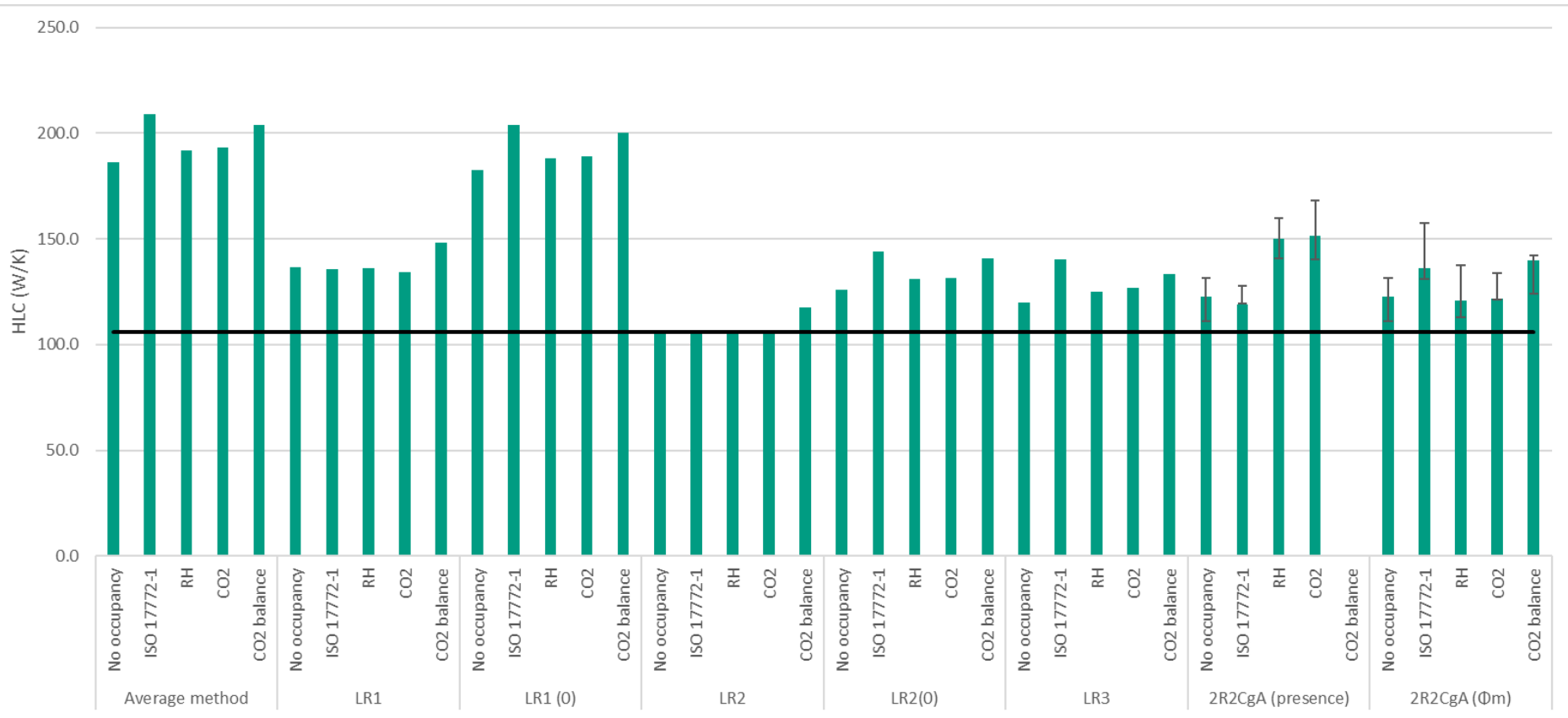


(e) Φ_m CO₂



(f) Φ_m CO₂ Balance

Results: Ukkel



Validation

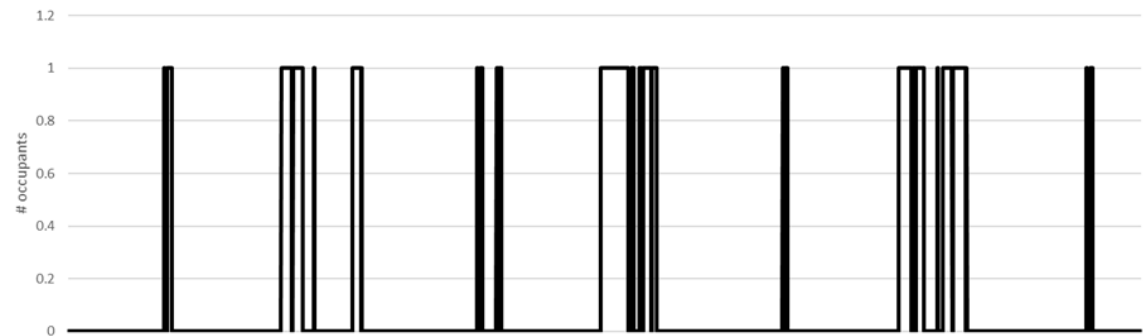
- Measurements of CO₂, RH and T (5 minute interval);
- Registration of # occupants (1 minute interval).

Case object:

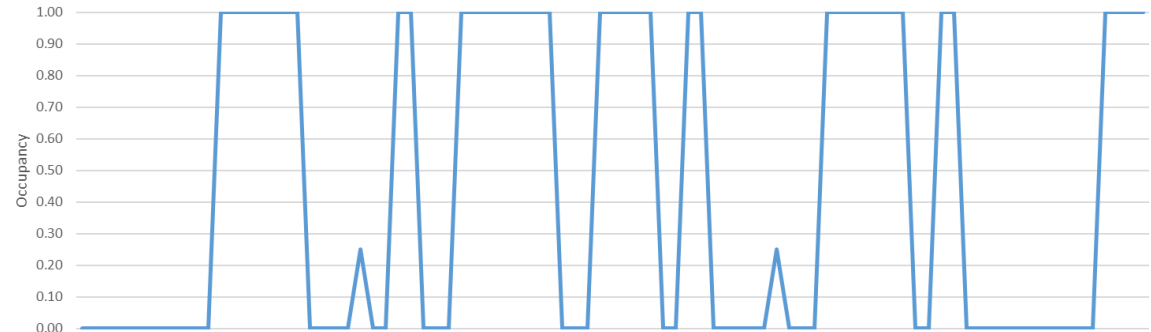
- Semi-detached house (1917);
- Naturally ventilated.



Actual occupancy



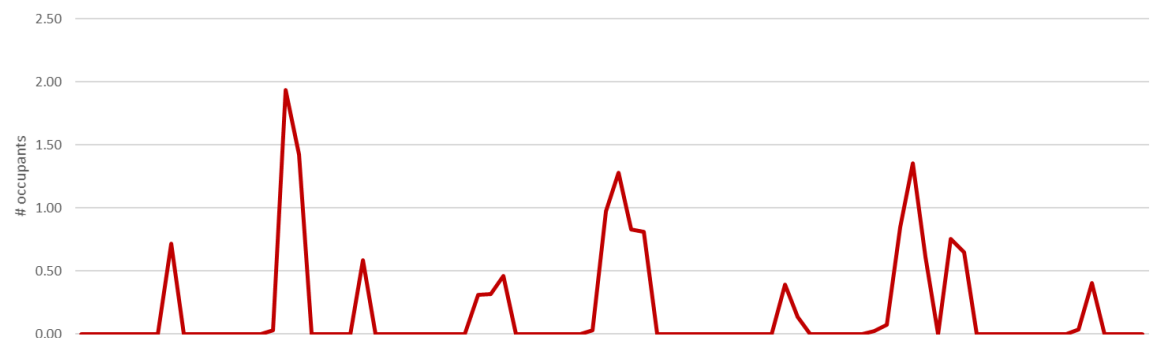
RH method



CO₂ method



CO₂ balance



Validation

Method	Persons x hours
Actual occupancy	11.0
RH method	37.5
CO ₂ method	24.8
CO ₂ balance	15.0