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Pollard Thomas Edwards

bd Architect of the Year Awards 2017 Housing Architect of the Year

AJ100 Winner 2018 Sustainable Practice of the Year

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Leeds Sustainability Institute

Virido – Cambridge Testing the Prototypes – Concept houses

Prof Chris Gorse, Tom Dollard & Prof David Johnston

Analysis David Farmer, David Glew & Alex Rice

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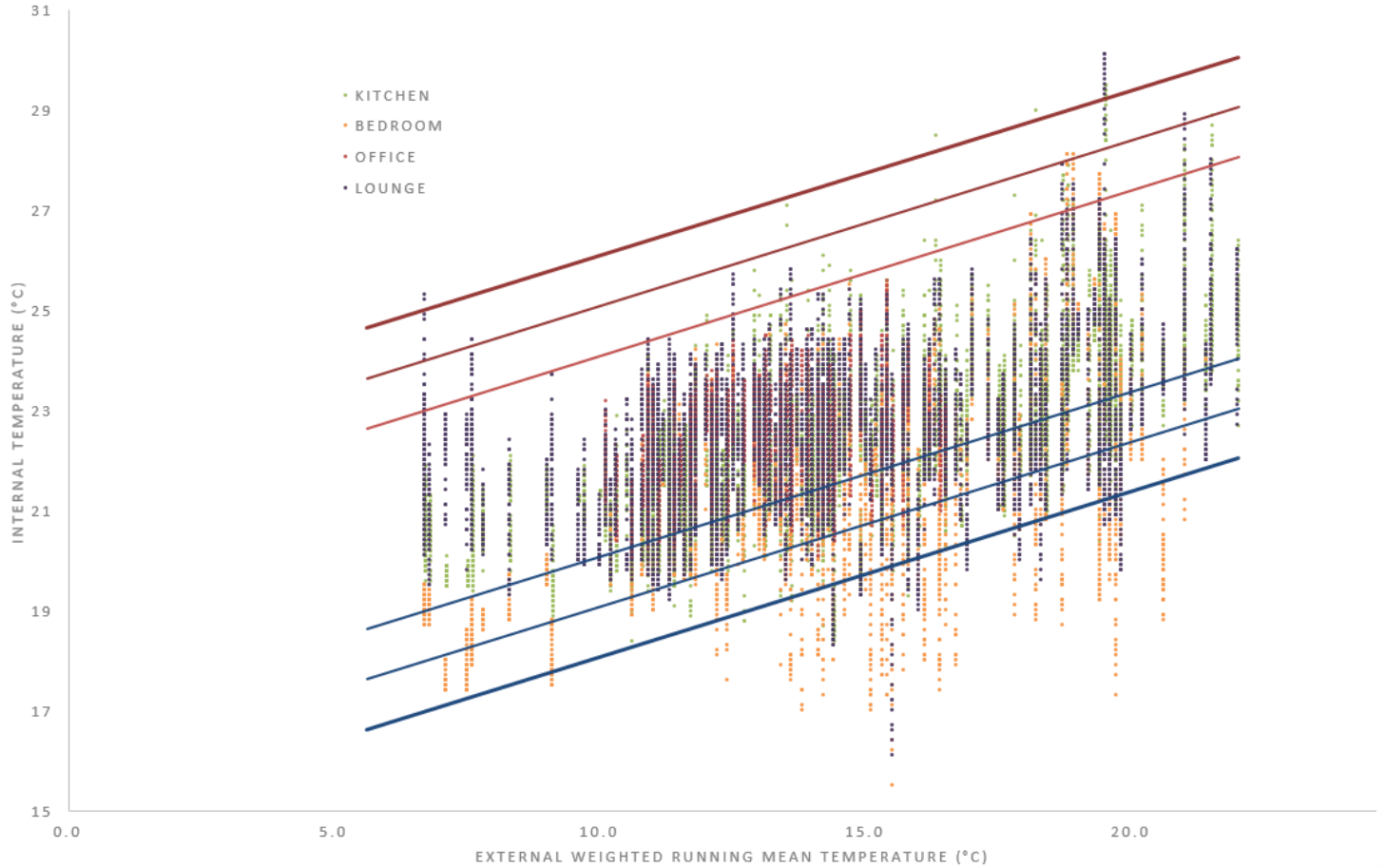
Adaptive Comfort – ISO 15251

- **Within comfort bands** except for the bedroom when it gets hot (outside) it seems to be a little cool, even though the respondents reported to be too warm.
- Perception and behaviour
- Possibility occupants over ventilating the bedrooms to stay cool?



Heating and Comfort

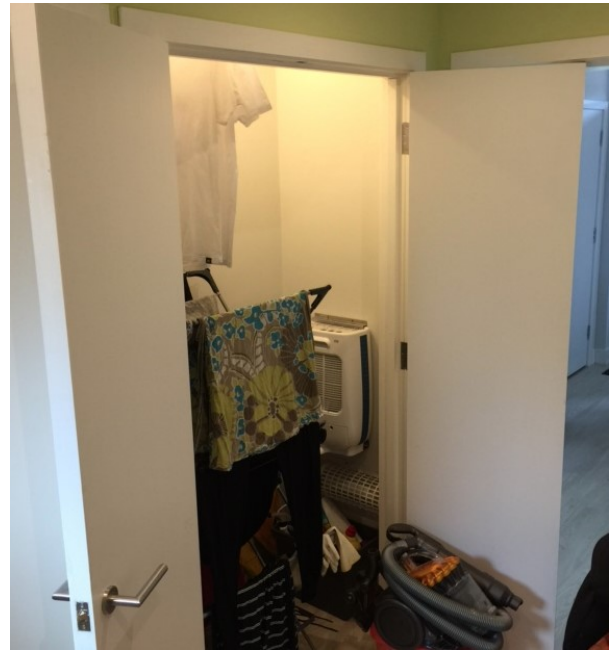
- ‘I think it was just set so that if it dropped below whatever temp you set it at, say 20º, then it would kick in.’ = other homes have the heat come on in the morning and then again in the evening. Since this is different from what many British households are accustomed to (and based on research showing that **hardly anyone understands their heating anyway**) … **need to educate occupants** to fully take advantage of heating system.
- ‘The problem was never that you were too cold, it was occasionally that you were **too warm**, but then you just opened up a window or turned the temperature down’ [this seemed like an afterthought].
- Slept with windows open. Bedroom (top floor) was too warm.
- You feel cold, you never snuggle under a blanket, concept house never need to. Someone asked her, **do you ever feel ‘cozy’? Not really**. ‘That’s something we’ll have to get used to in these new houses.’

MVHR - feedback

- Positives: Does an excellent job of ridding house of odours. Reduces condensation from cooking and humidity in bathroom. Possible health benefits (fewer colds, illnesses not lasting as long).
- Negative: Noise is worst in bedroom area. Was an irritant at first but appropriate adjustments were made.
- Boost switch should have a timer switch instead of on/off. People turn it on and forget to turn it off.
- Felt that they could live without MVHR

Drying cupboard

- Trial and error … but ‘Once we’d learnt how to use it, it worked really well.’ Needed to learn a) where to place clothes, and b) unit cut out when doors were closed, especially in warmer weather – had to be switched off and switched back on.
- ‘We were quite enthusiastic about the technology in the house, having won the competition, but someone buying the house could just give up ‘that doesn’t work, I won’t use it’.
- [Note: when we went with the estate agent to view the concept house she mentioned that ‘you could add a tumble dryer’ and that quite a few potential buyers said they would]
- May want to consider louvred doors on drying cupboard to allow for air flow and education on the use of this feature will be critical.



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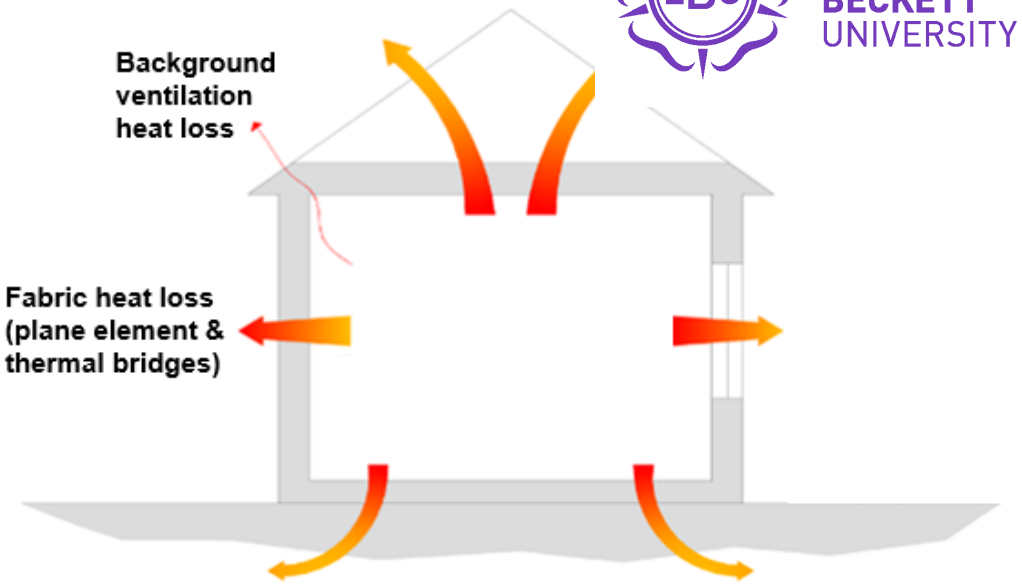
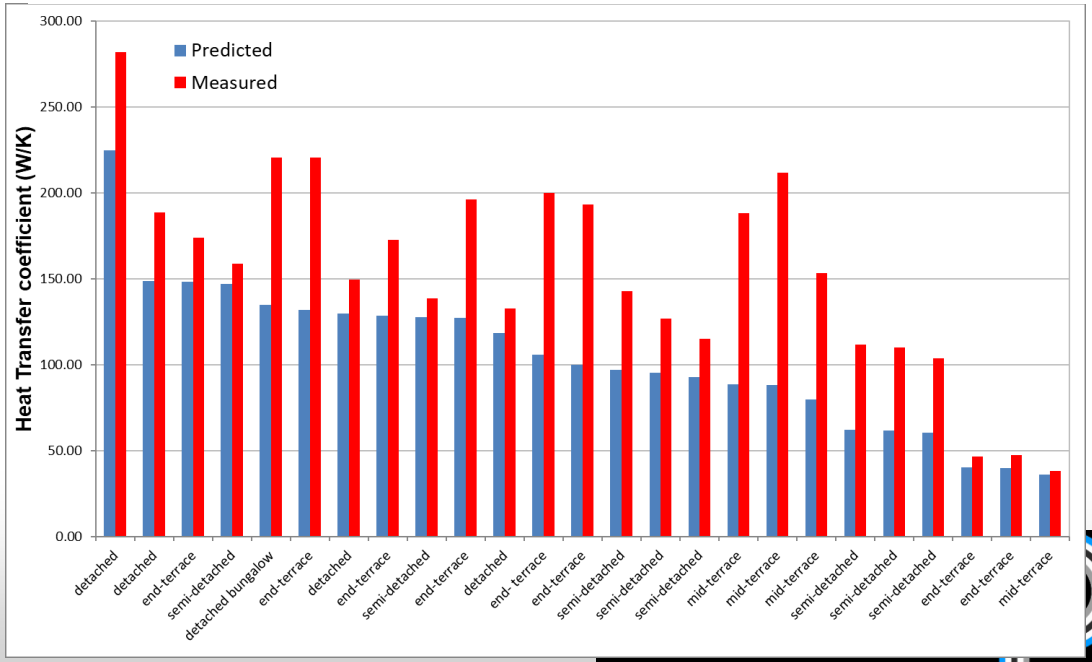
- The Heat Transfer Coefficient (HTC) represents the total rate of heat loss from a building envelope.
  - The HTC is the aggregate heat loss from plane elements, thermal bridging, and ventilation.
  - The HTC is expressed in units W/K.
- Measuring the HTC *in situ* allows a comparison to be made between the predicted and as-built heat loss of a building.
  - The discrepancy between these two values is commonly known as the *building fabric performance gap.*





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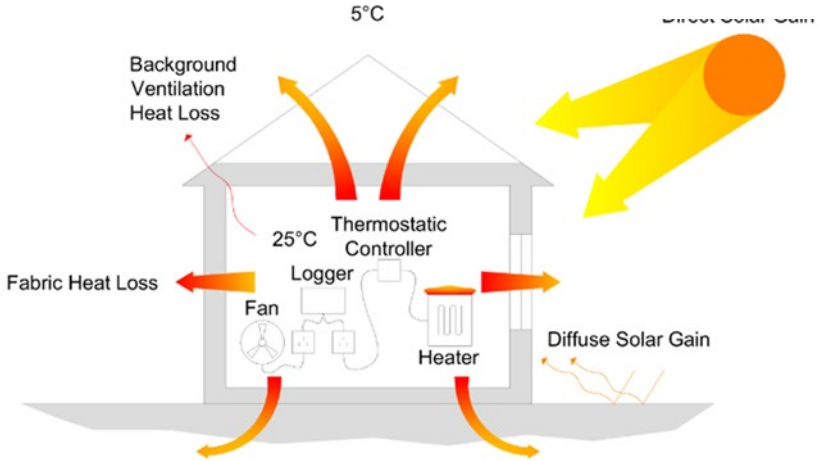
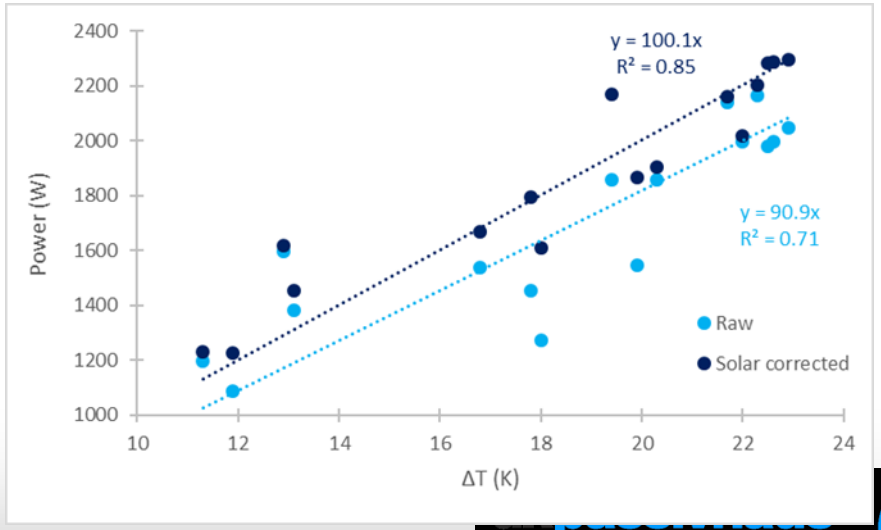
HTC Measurement

- The electric coheating test ‘gold standard’ method for measuring the HTC of a building *in situ*.
- Heating the internal environment of a building to an elevated, homogenous, and constant temperature with electric heaters and then maintaining that temperature over 10-21 days.
- Power input to the dwelling, as well as the internal and external environmental conditions, monitored throughout the test.
- Coheating test data analysis is undertaken using multiple linear regression analysis which accounts for additional power input from solar gains.
- Each house was subject to a coheating test prior to occupation





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Coheating Test Results

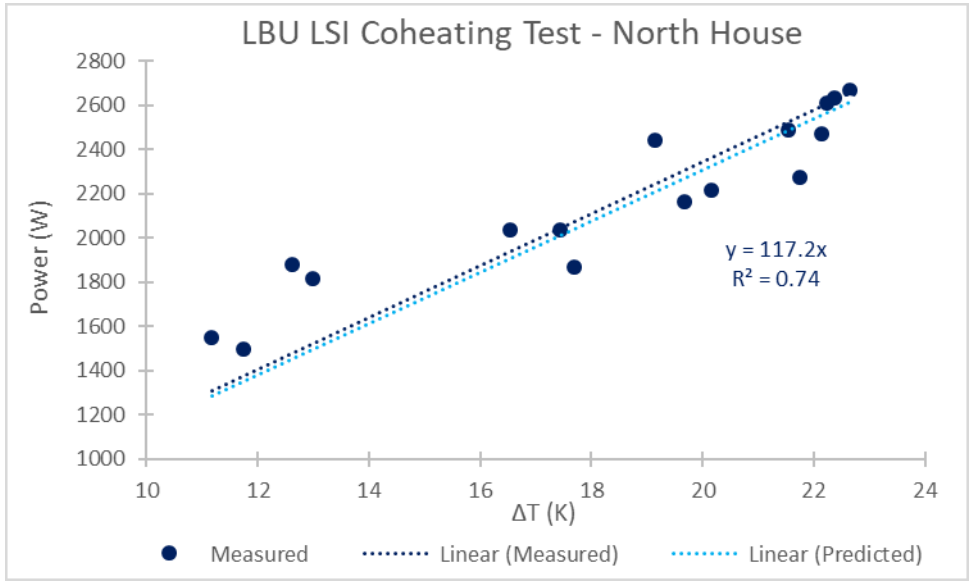
North House

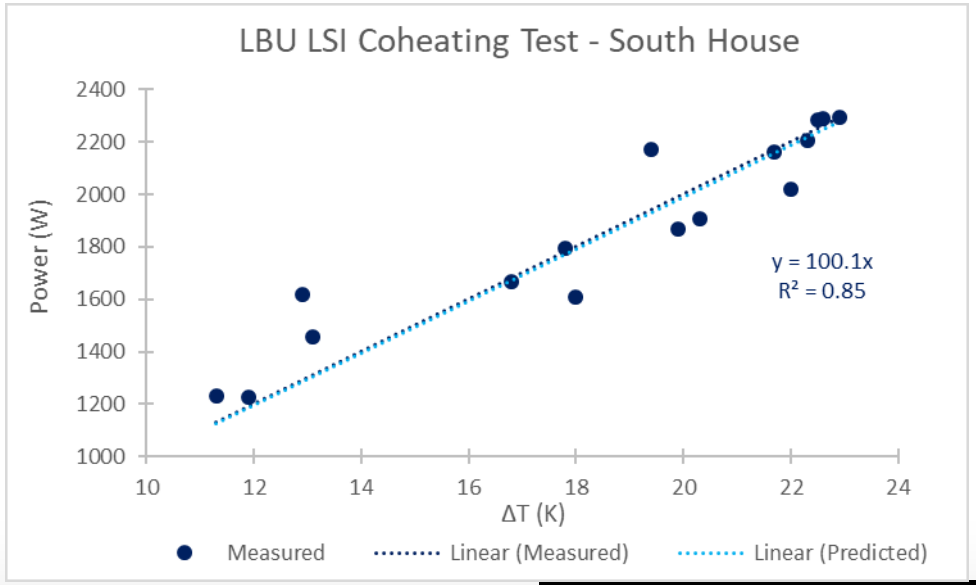
- Predicted HTC = **115.3 W/K**
- Measured HTC = **117.2 (±4.5) W/K**
- Discrepancy is within measurement uncertainty, thus this house can be considered to have a **0% performance gap.**
- Heat loss parameter (HLP) = 0.78 W/m^{2}K

South House

- Predicted HTC = **99.5 W/K**
- Measured HTC = **100.1 (±3.3) W/K**
- Discrepancy is within measurement uncertainty, thus this house can be considered to have a **0% performance gap.**
- HLP = 0.67 W/m^{2}K

- Heat loss parameters extremely low compared to typical new build dwellings





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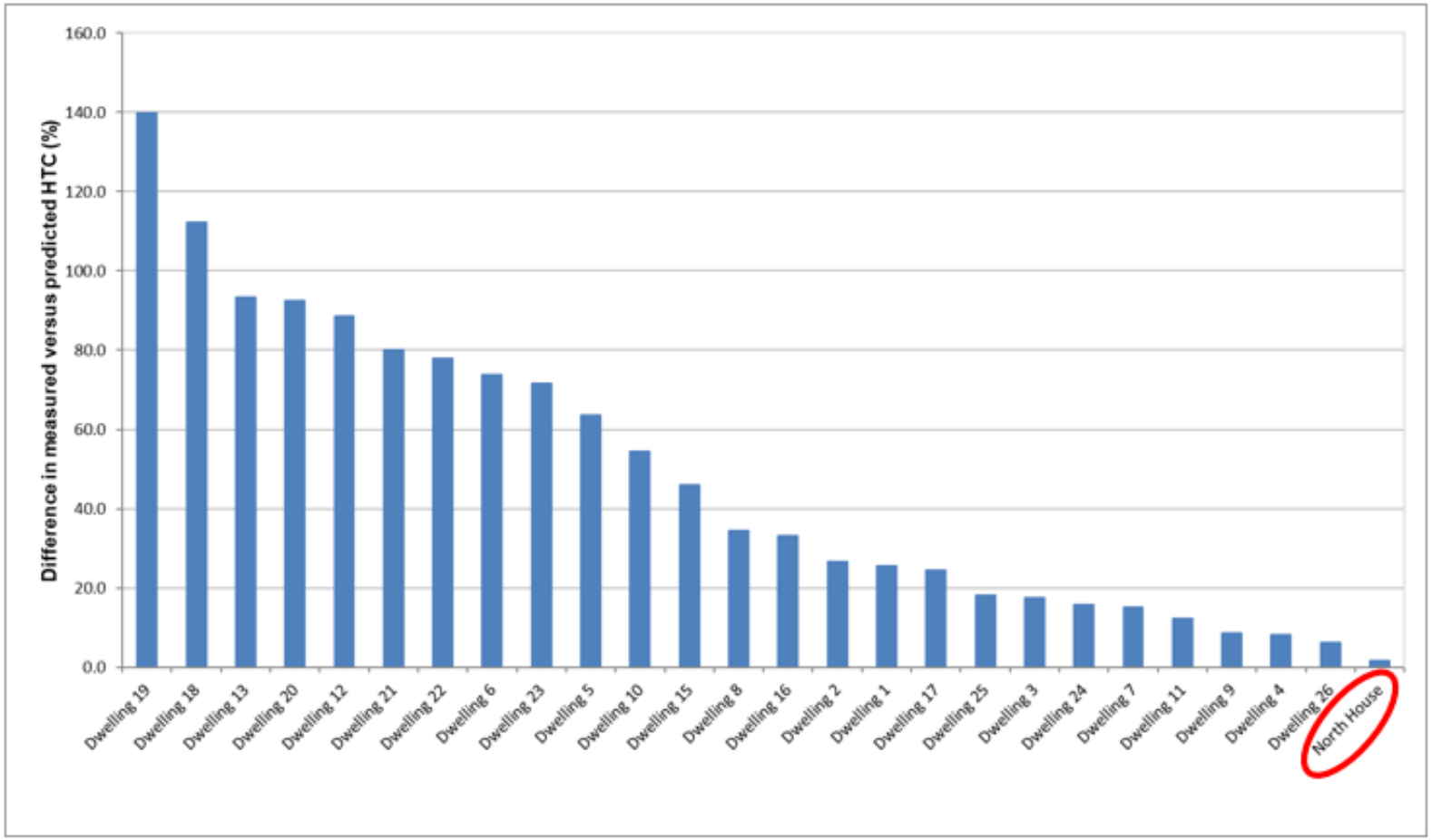
- The discrepancy between predicted and measured HTC is the lowest that the LSI have measured (both the absolute and percentage value)
- Testament to the quality of the design and build process.



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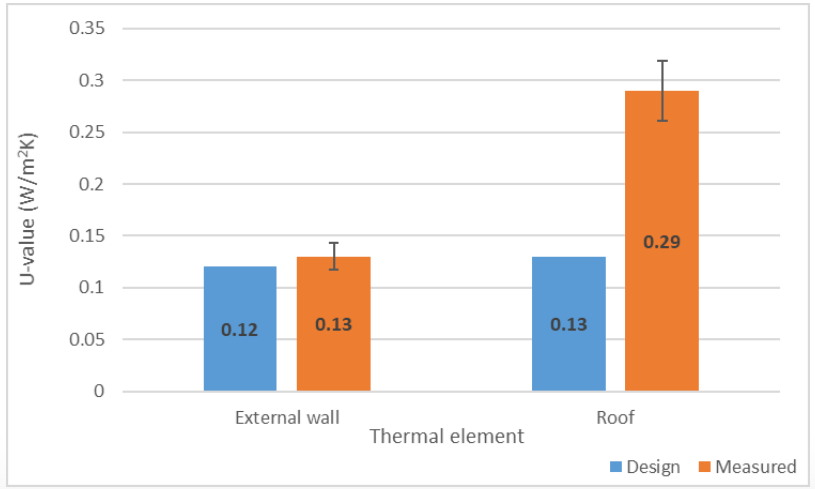
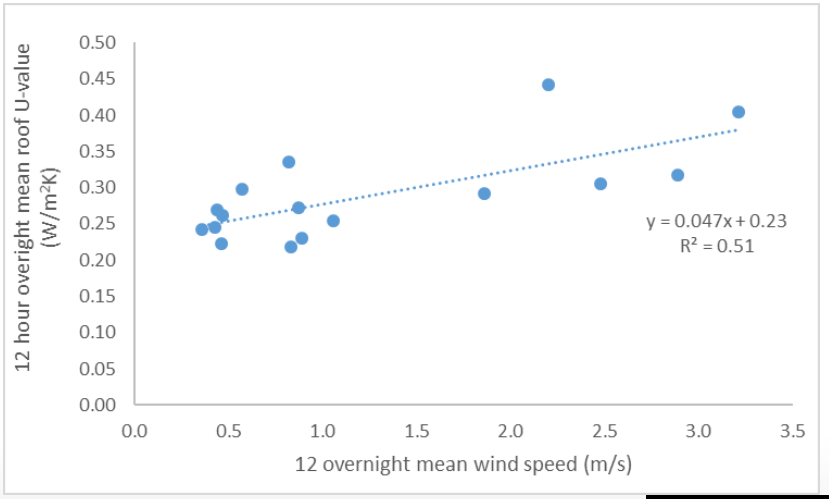
In situ U-value measurements

- *In situ* U-value measurements of the external wall and roof of the North House were undertaken in accordance with ISO 9869.
- The external walls performed as predicted by design calculations.
- The roof underperformed by 123%. There was correlation between wind speed and heat loss which could indicate thermal bypassing of the insulation layer.





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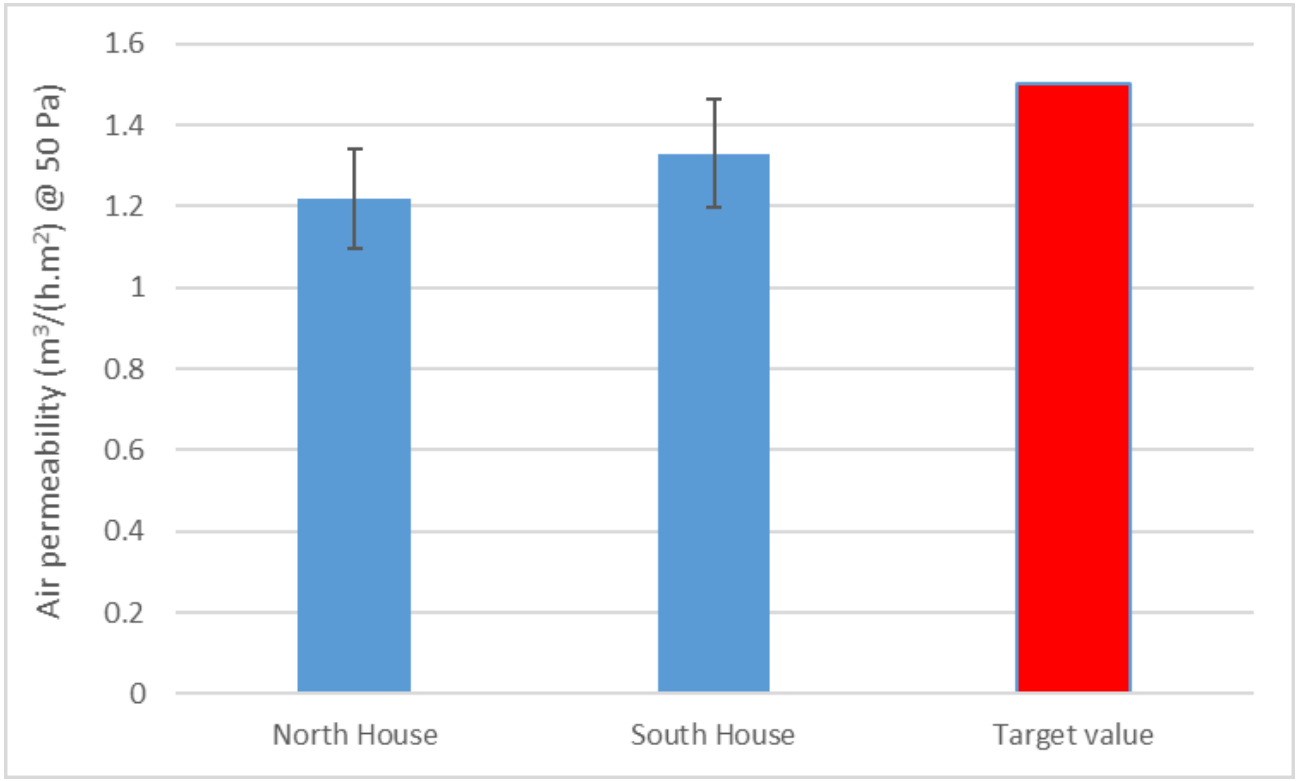
Air permeability

- The air permeability of each house was measured in accordance with ATTMA TS1
- Each house performed better than the design target of 1.5 $m^3/(h.m^2)$ @ 50 Pa
- Extremely airtight by in comparison to typical new build houses.



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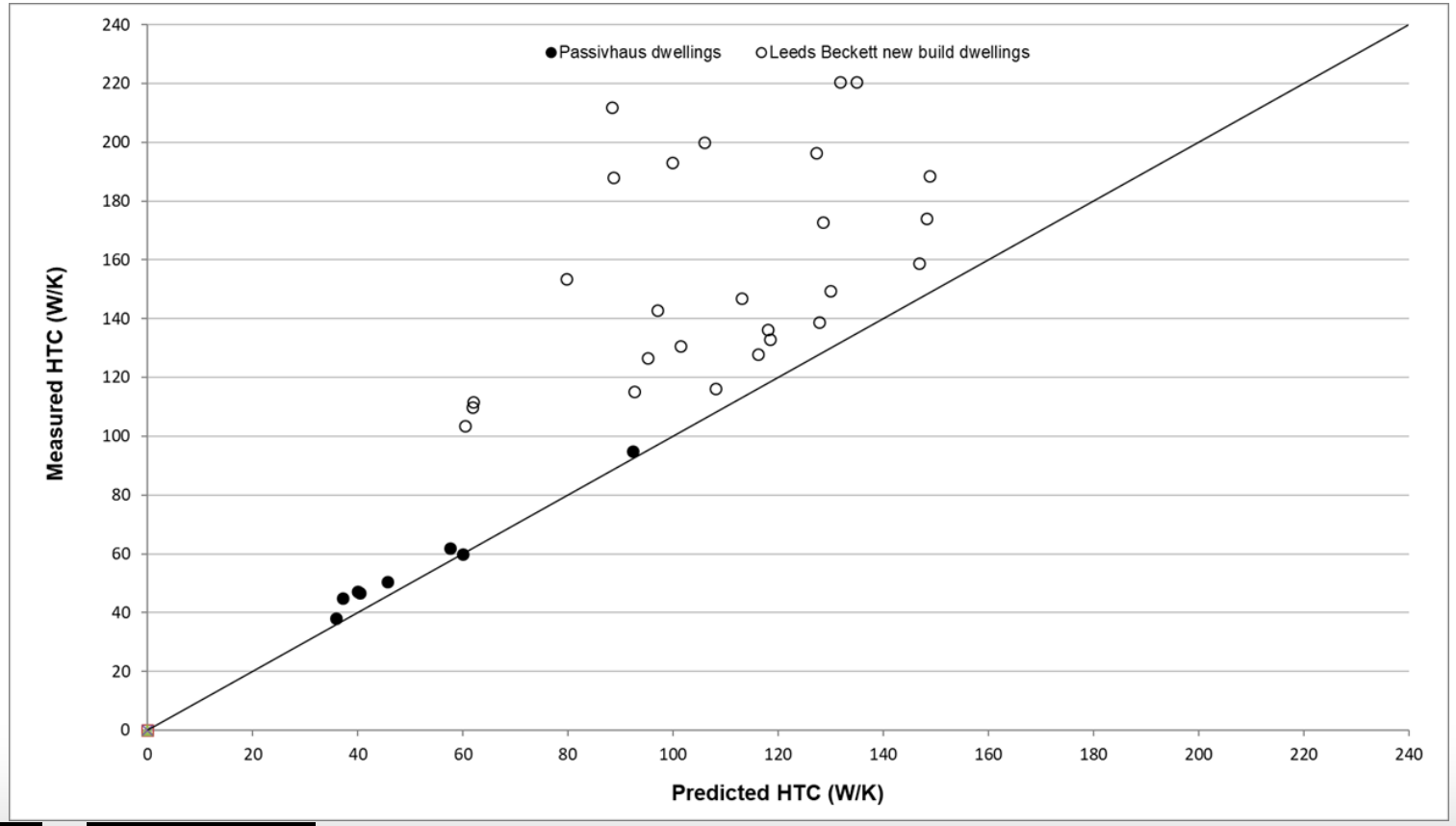
Passivhaus dwellings and standard build (new buildings)

- Professor David Johnston



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