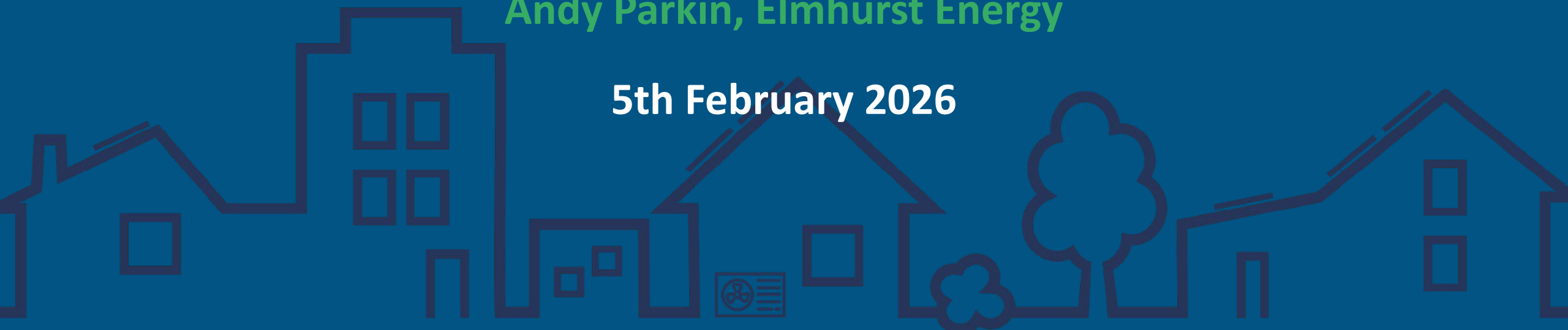
BUILD TEST SOLUTIONS

Better Data Better Buildings: U-values for Performance & Compliance

Richard Jack, BTS
Prof Richard Fitton, University of Salford
Andy Parkin, Elmhurst Energy

5th February 2026



Today’s speakers

Dr. Richard Jack
Build Test Solutions

Prof. Richard Fitton
University of Salford

Andrew Parkin
Elmhurst Energy

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Contents

- The problem with assumed U-values [RJ]
- What the research says [RF]
- U-value measurement in practice [AP]
- What change looks like [RJ]

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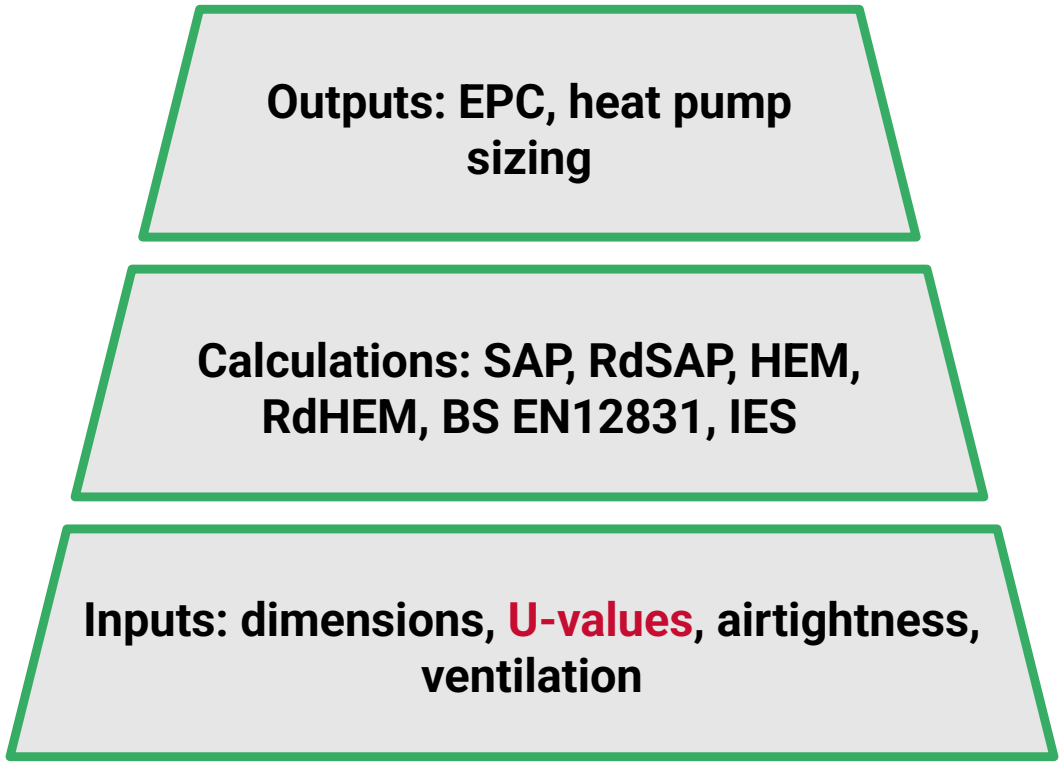
What, why and why now?

U-values are foundational



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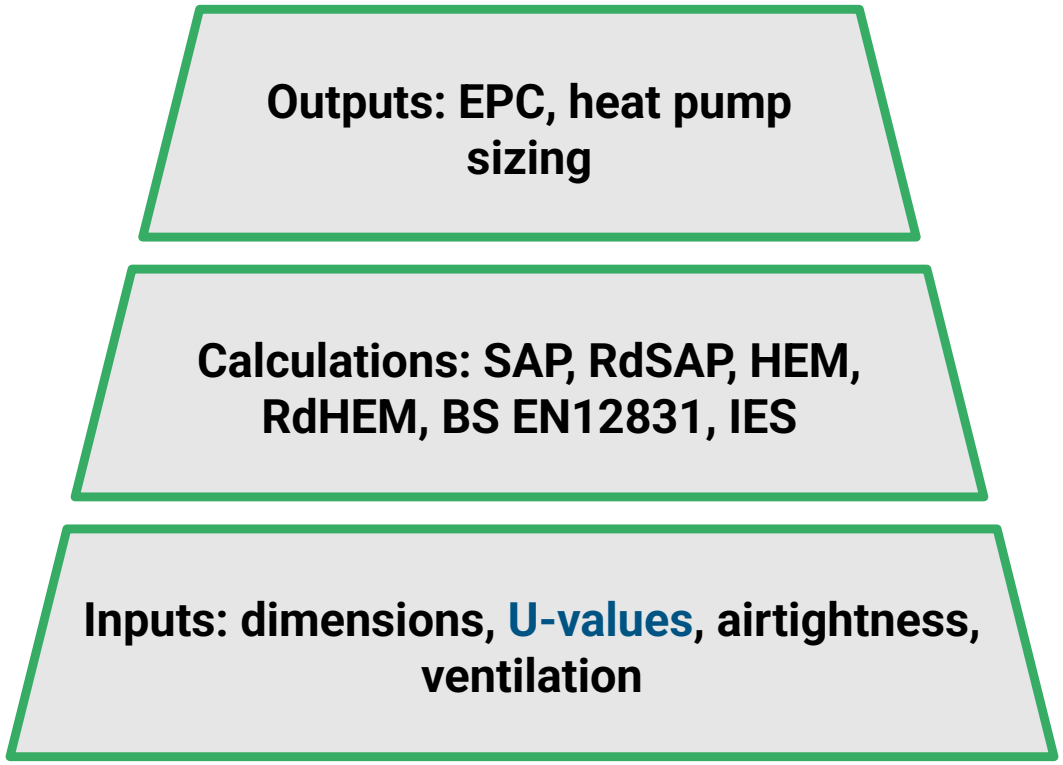
U-values are foundational



- EPCs
- Warm Homes Plan
- Net Zero
- Fuel poverty

…

- Billions £££
- People's health

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What and why now?

What?

- A sentence added to RdSAP conventions
- Use of mature technologies to calibrate EPCs
- Just like airtightness

Why now?

- Warm Homes Plan
- HEM & EPC consultation

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The problem with assumed U-values

Business as usual

Table S6 : Wall U-values – England and Wales

Age band	A	B	C	D	E	F	G	H	I	J	K	L
Wall type												
Stone: granite or whinstone as built	a	a	a	a	1.7 b	1.0	0.60	0.60	0.45	0.35	0.30	0.28
Stone: sandstone or limestone as built	a	a	a	a	1.7 b	1.0	0.60	0.60	0.45	0.35	0.30	0.28
Solid brick as built	2.1	2.1	2.1	2.1	1.7	1.0	0.60	0.60	0.45	0.35	0.30	0.28
Stone/solid brick with 50 mm external or internal insulation	0.60	0.60	0.60	0.60	0.55	0.45*	0.35*	0.35*	0.30*	0.25*	0.21*	0.21*
Stone/solid brick with 100 mm external or internal insulation	0.35	0.35	0.35	0.35	0.35	0.32*	0.24*	0.24*	0.21*	0.19*	0.17*	0.16*
Stone/solid brick with 150 mm external or internal insulation	0.25	0.25	0.25	0.25	0.25	0.21*	0.18*	0.18*	0.17*	0.15*	0.14*	0.14*
Stone/solid brick with 200 mm external or internal insulation	0.18	0.18	0.18	0.18	0.18	0.17*	0.15*	0.15*	0.14*	0.13*	0.12*	0.12*
Cob (as built)	0.80	0.80	0.80	0.80	0.80	0.80	0.60	0.60	0.45	0.35	0.30	0.28
Cob with 50 mm external or internal insulation	0.40	0.40	0.40	0.40	0.40	0.40	0.35*	0.35*	0.30*	0.25*	0.21*	0.21*
Cob with 100 mm external or internal insulation	0.26	0.26	0.26	0.26	0.26	0.26	0.24*	0.24*	0.21*	0.19*	0.17*	0.16*
Cob with 150 mm external or internal insulation	0.20	0.20	0.20	0.20	0.20	0.20	0.18*	0.18*	0.17*	0.15*	0.14*	0.14*
Cob with 200 mm external or internal insulation	0.16	0.16	0.16	0.16	0.16	0.16	0.15*	0.15*	0.14*	0.13*	0.12*	0.12*
Cavity as built	2.1	1.6	1.6	1.6	1.6	1.0	0.60	0.60	0.45	0.35	0.30	0.28
Unfilled cavity with 50 mm external or internal insulation	0.60	0.53	0.53	0.53	0.53	0.45	0.35*	0.35*	0.30*	0.25*	0.21*	0.21*
Unfilled cavity with 100 mm external or internal insulation	0.35	0.32	0.32	0.32	0.32	0.30	0.24*	0.24*	0.21*	0.19*	0.17*	0.16*
Unfilled cavity with 150 mm external or internal insulation	0.25	0.23	0.23	0.23	0.23	0.21	0.18*	0.18*	0.17*	0.15*	0.14*	0.14*
Unfilled cavity with 200 mm external or internal insulation	0.18	0.18	0.18	0.18	0.18	0.17*	0.15*	0.15*	0.14*	0.13*	0.12*	0.12*
Filled cavity	0.50	0.50	0.50	0.50	0.50	0.40	0.35	0.35	0.45†	0.35†	0.30†	0.28†

- Look up table, or calculation
- **A U-value per construction type**

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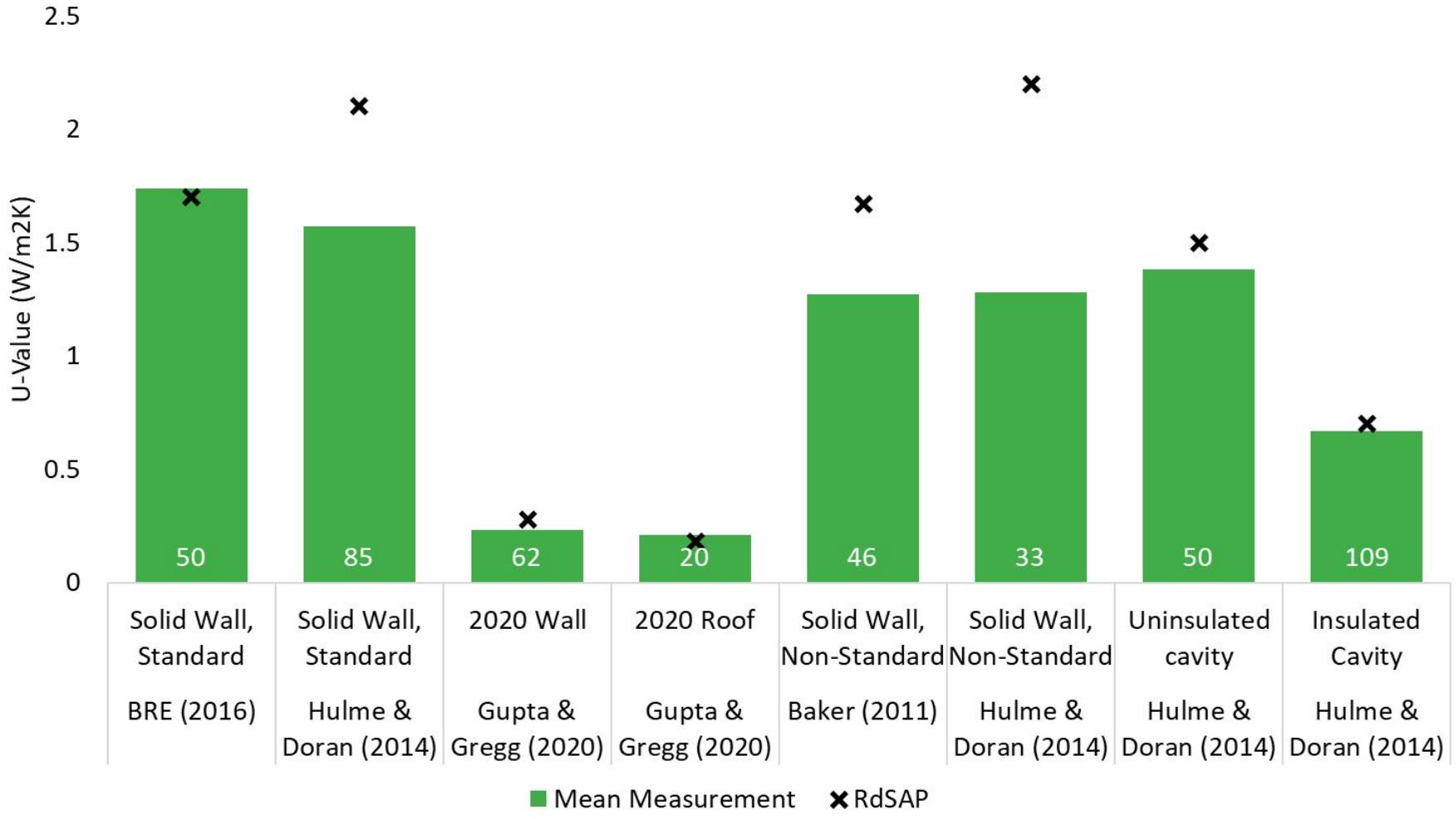
Are look-up tables right?



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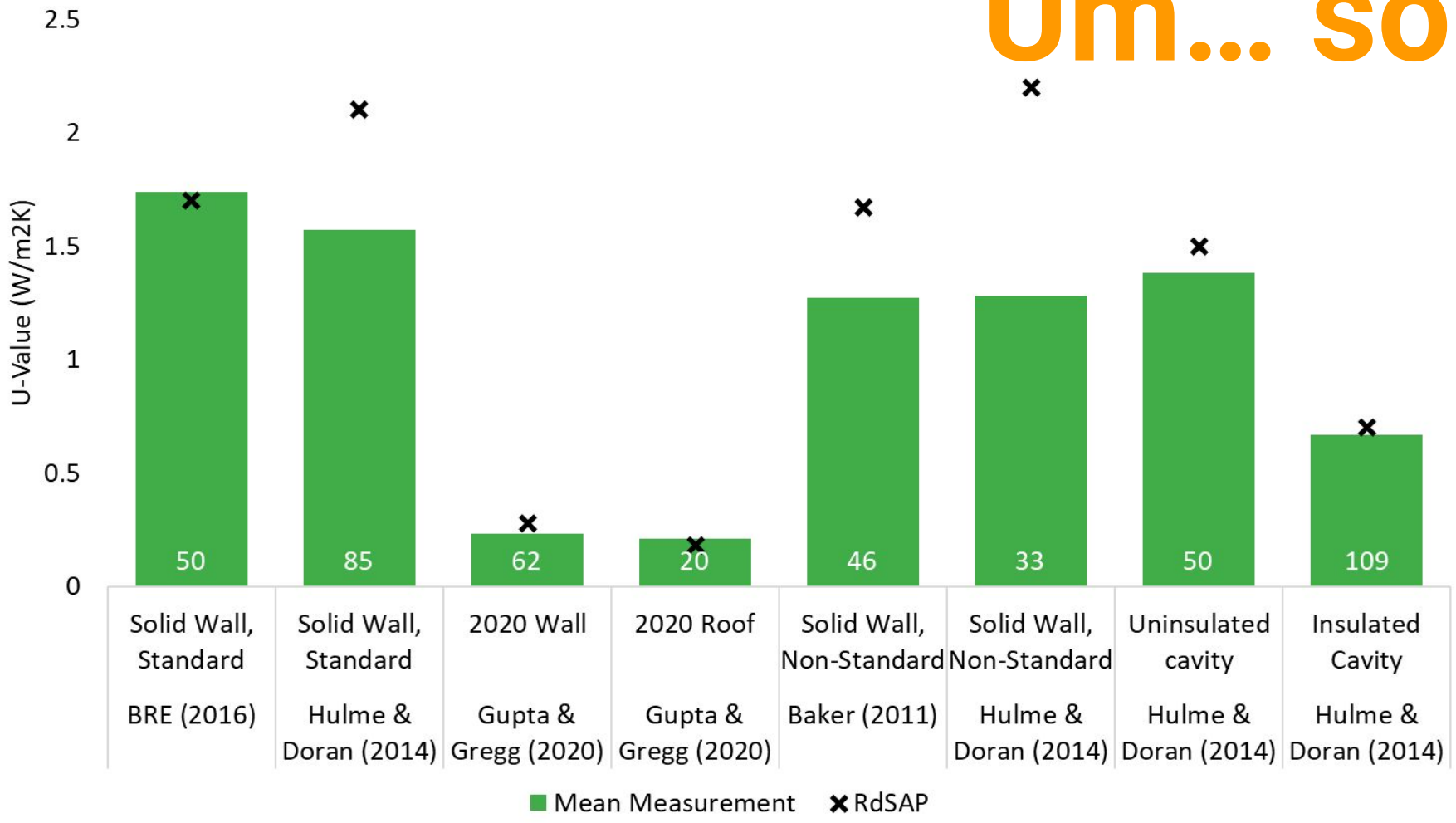
Are look-up tables right?

Um... sort of



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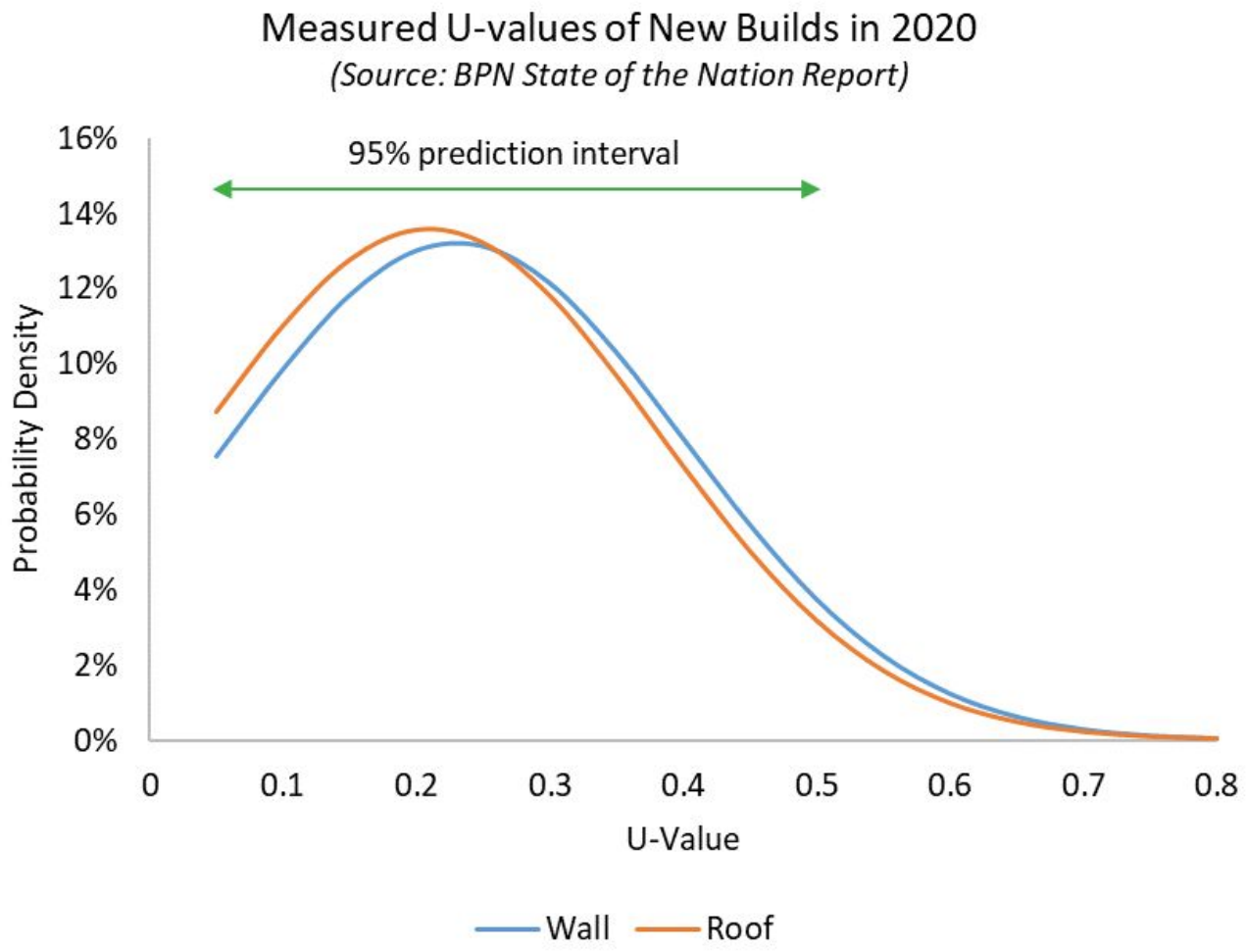
Variety is the spice of life?



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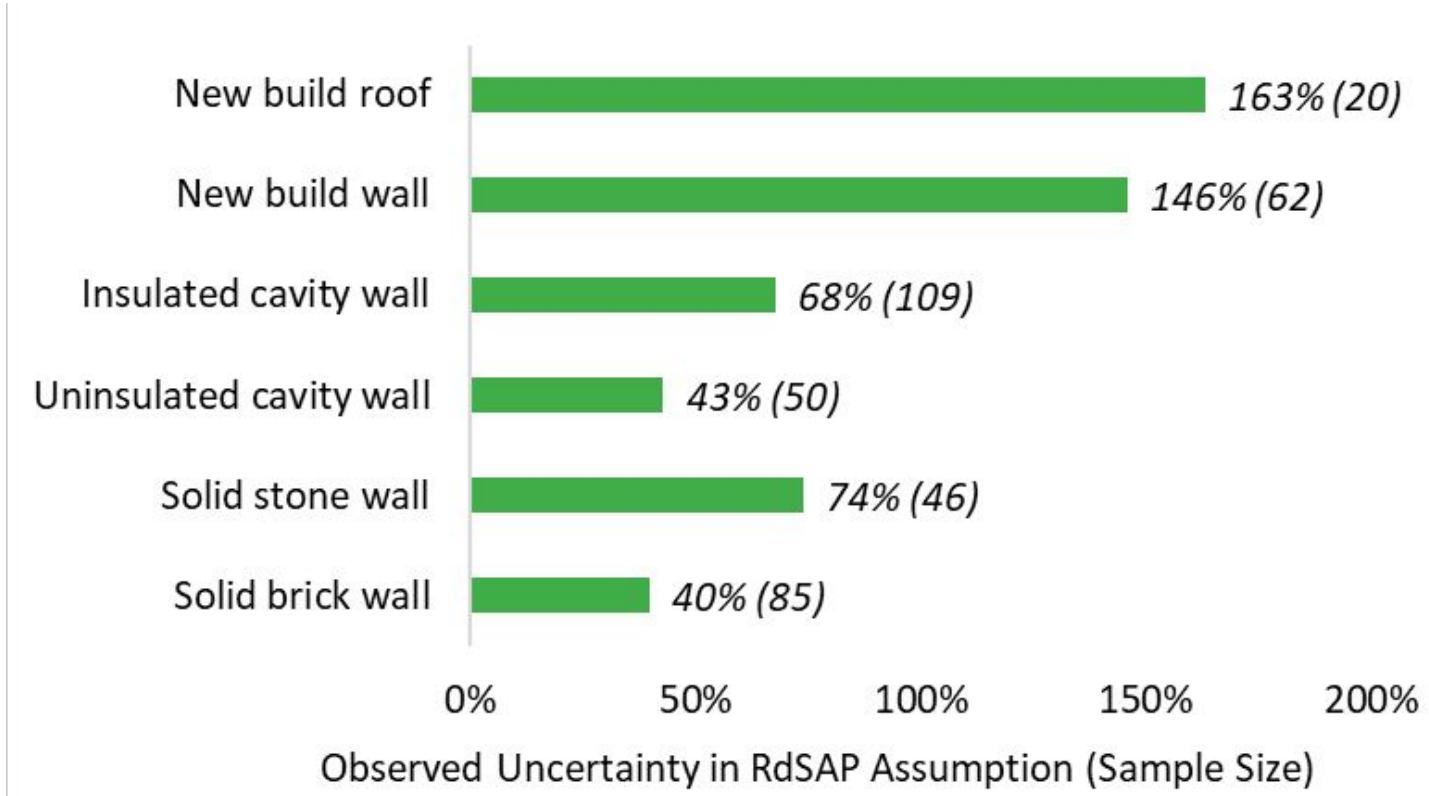
Are they right for every house?



Data from:
BRE (2016). Solid wall heat losses and the potential for energy saving.
Baker (2011). U-values and traditional buildings: In situ measurements and their comparisons to calculated values.
Hulme, J & Doran, S. (2014). In-situ measurements of wall U-values in English housing..
Gupta & Gregg (2020). State of the nation review: Performance evaluation of new homes.

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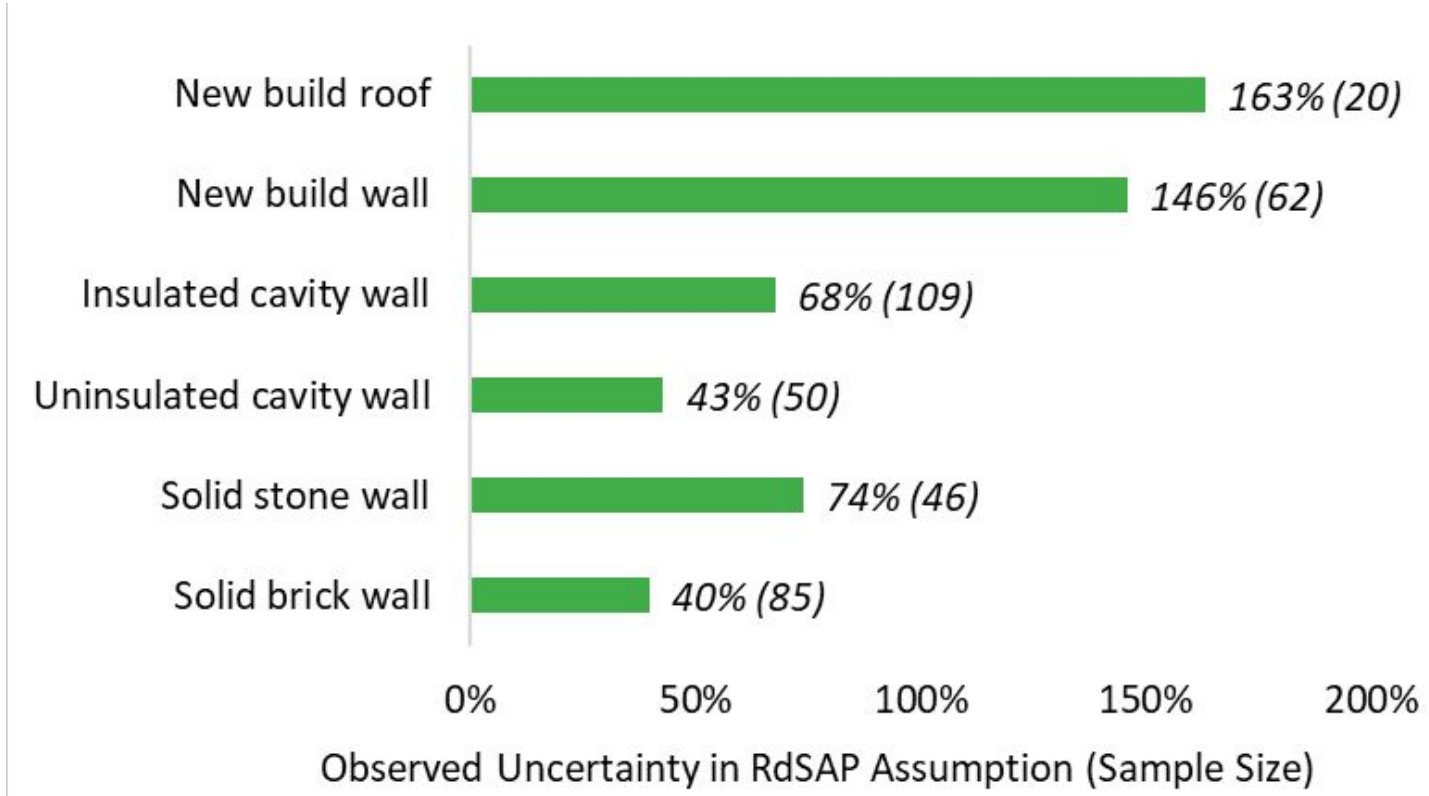
Are they right for every house?

No



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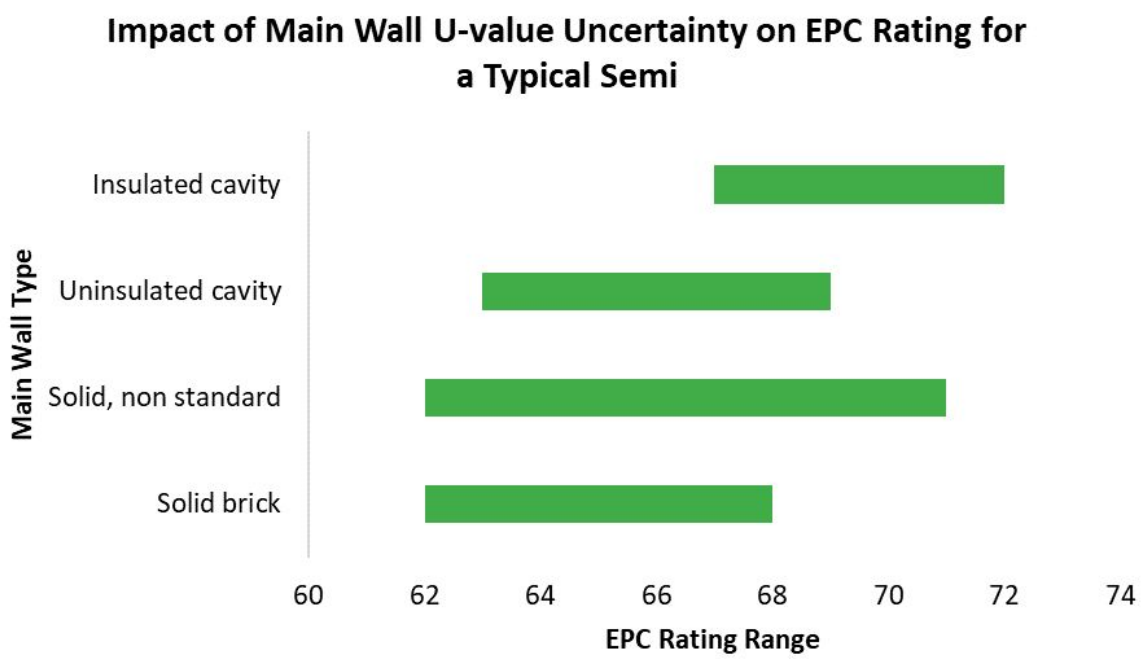
What impact does this inaccuracy have?

- EPC band shifts
- Mistargeted retrofits
- Unintended consequences
- Heating system sizing
- Incentivise best practice



Decisions on £1,000s spend & resident health

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What the research says

National Trust

University of Salford MANCHESTER

ENERGY HOUSE LABS:

A Comparison of SAP/RdSAP Assumptions vs Measured U-values in Pre-1919 Dwellings

Richard Fitton[1], Benjamin Roberts[1], Mohamed Dgali[1], Samantha Organ[2], Grant Henshaw[1], Will Swan[1]

ENERGY HOUSE LABS

AIMS

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- Compare SAP/RdSAP assumptions vs measured U-values.
- Sample: 9 pre-1919 National Trust homes.
- Method: In-situ tests + SAP/RdSAP model simulations.
- What is the effect of inserting measured values.

SAMPLE

Nine residential properties from the National Trust's domestic let estate.

Geographic Location:

Properties located across the **North and Midlands** regions of England.

Construction Type:

All buildings were **pre-1919 traditional solid wall** construction.

Property Types:

- 3 were **semi-detached solid brick** houses
- 6 were **detached solid stone** houses (limestone or sandstone)

Floor Area:

- Range: **72 m² to 245 m²**
- Median: **124 m²**

For comparison, the **average dwelling size in England** is **97 m²**

PREVIOUS WORK

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Performance Gap:

A consistent **gap exists** between **modelled U-values** and **in-situ measurements**.

Rye & Scott (2012):

- Found that in **77% of cases**, **modelled wall U-values** underestimated actual performance.
- Models stated walls were **worse performing** than they really were.

Hulme & Doran (2014):

- Focused on **solid brick walls**, typical of many pre-1919 dwellings.
- Found the **SAP model** used an **overestimated U-value** of **2.1 W/m²K**.
- **Field results** (n = 300) showed a **median U-value** of **1.59 W/m²K**.

- This led to an **update in SAP**, changing the solid wall U-value to **1.7 W/m²K** (BRE, 2012).
- Changes to wall thickness and U-values have also been added

METHODS

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U-values

- **To ISO9869 Part 1 (heat flux plates) – with allowance made for thermal storage.**

All methods, uncertainties etc can be found in paper in full.

RESULTS: U-VALUE - WALLS

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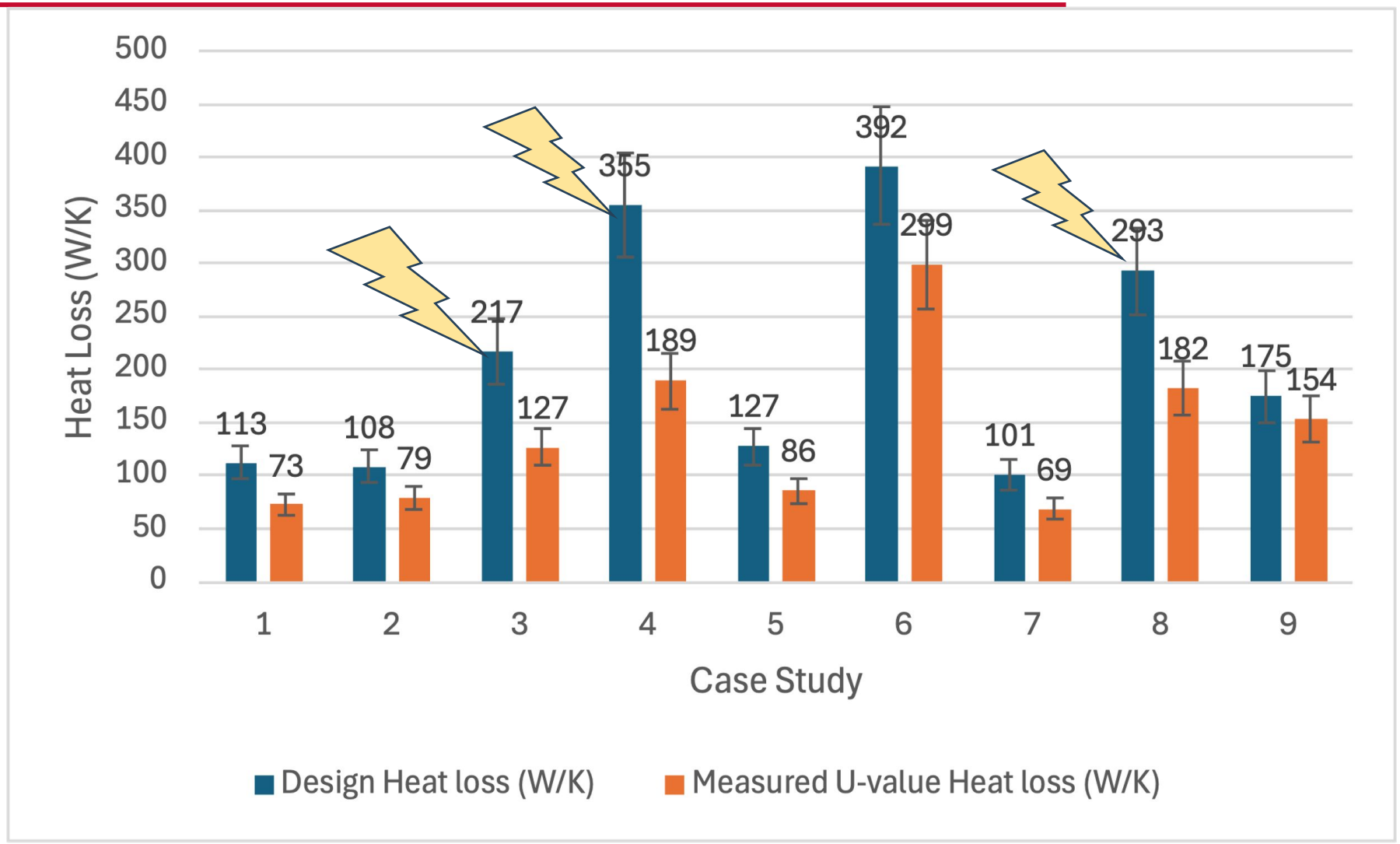
REF	Assumed U-value in model (W/m^2K)	Wall material/ type	Measured U-value (W/m^2K)	Difference	
				Absolute (W/m^2K)	Percentage (%)
1	1.70	Solid brick	1.10 (±0.15)	0.60 (±0.15)	35.3 (±14.0)
2	1.70	Solid brick	1.24 (±0.17)	0.46 (±0.17)	27.1 (±14.0)
3	1.70	Solid brick	0.99 (±0.14)	0.71 (±0.14)	41.8 (±14.0)
4	2.40	Sandstone (solid) 550 mm	1.28 (±0.18)	1.12 (±0.18)	46.7 (±14.0)
5	1.90	Sandstone (solid) 300 mm	1.28 (±0.18)	0.62 (±0.18)	32.6 (±14.0)
6	1.90	Sandstone (solid) 550 mm	1.45 (±0.20)	0.45 (±0.20)	23.7 (±14.0)
7	1.90	Sandstone (solid) 550 mm	1.29 (±0.18)	0.61 (±0.18)	32.1 (±14.0)
8	2.20	Sandstone (solid) 400 mm	1.37 (±0.19)	0.83 (±0.19)	37.7 (±14.0)
9	1.90	Sandstone (solid) 550 mm	1.67 (±0.23)	0.23 (±0.23)	12.1 (±14.0)

RESULTS: HEAT LOSS - WALLS



CAVEATS

- SMALL SAMPLE – Limited to Nine Heritage Homes
- Uncertainty and full methods in the paper
- This is a case study approach – note statistically significant, but **nonetheless interesting**

MAIN FINDINGS

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- The measured U-values differed significantly from the assumed ones and were, in all cases, lower than the assumed values, for both stone and brick walls
- When comparing simulation outputs, the results varied significantly when using measured inputs compared to assumed values across the three SAP software versions, averaging 11% across nine case study buildings.

MEES ARE COMING !!

- Historic building performance can potentially limit rental of a property or determine the extent of a retrofit.
- **Of the nine case study buildings, four increased in EPC** rating through the use of measured data. POLICY, METHOD AND ACCREDIATATION to ADD Measured U-values to RdSAP and Full SAP
- WATCH THIS SPACE !

THANKS

Thanks to National Trust
This work was funded by the National Trust. Thanks is given to their estates department for helping and enabling this work, in particular Emma O'Brien, Ben Ford, Paul Neary, Paul McGee. Plus many others who I might not have mentioned.

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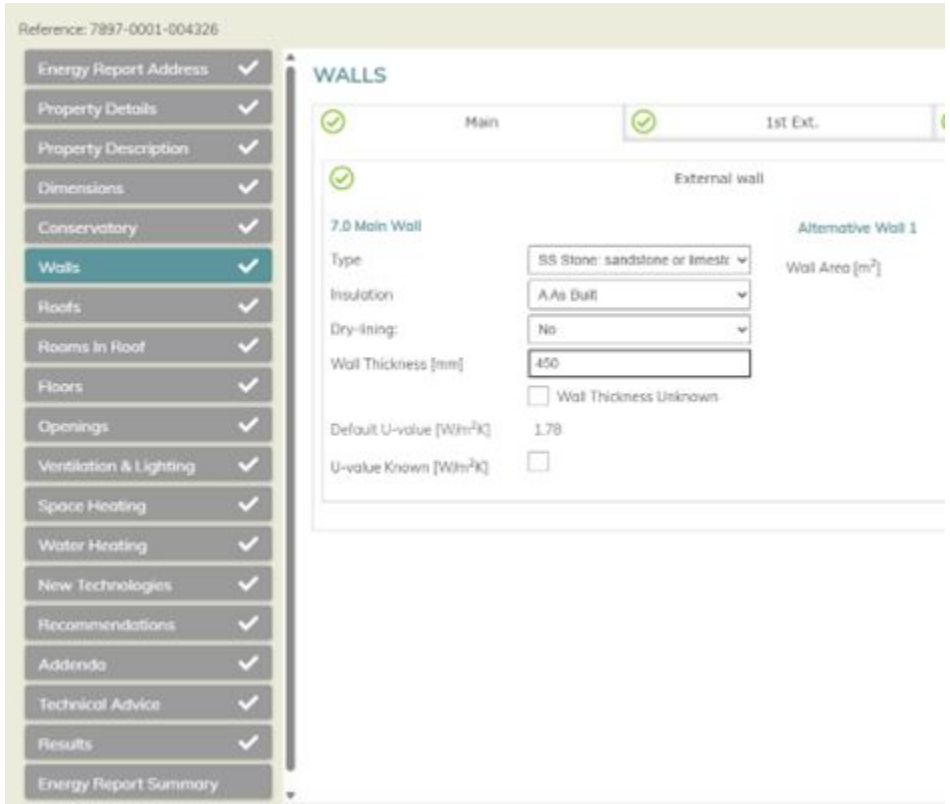
U-value measurement in practice

EPCs already accept U-values as inputs



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Competency Schemes

- A competency scheme is a structured framework or system used to assess, develop and manage the skills, knowledge and behaviours of a specific role or profession.
- It defines the competencies (specific skills and abilities) that individuals must possess to perform effectively their job or field

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Competency Schemes

- This is a well trodden path for Elmhurst Energy
- Development of schemes allows for members to demonstrate competency, backed by QA, technical support and insured
- Trust and independence is crucial
- The model/framework can be recognised and replicated

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Measurement in practice

- Cost and Disruption comparable to Air Tightness
- ISO 9869 Part 1 & 2 already exist

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Future Proofing

- The framework is future-proofed
- Home Energy Model for FHS and for Existing Dwelling - u-value is definable
- Trailblazer Combined LAs are looking at how to make use of measurement in M&E and funding optimisation - HTC, Air Pressure and In-situ u-value - for future Retrofit Programmes

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What does change look like?

RdSAP 10 conventions - 3.08:

The U-values of existing elements (walls/roofs/floors, etc.) must be the RdSAP default values (e.g. entered "as built") and must not be overwritten unless specific documentary evidence of the thermal conductivity of individual materials of the building element of the property being assessed is provided and was undertaken in accordance with BR 443 "Conventions for U-value calculations" (BRE, 2006) or by an in-situ measurement following ISO9869.

The U-value is that of the whole element, including any added insulation.

Documentary evidence applicable to the property being assessed (see convention 9.02) must be provided and recorded if overwriting any default U-value. This evidence shall be either:

- *relevant building control approval, which both correctly defines the construction in question and states the calculated U-value; or*
- *a U-value calculation produced or verified by a person with suitable expertise and experience; or*
- *A U-value measurement carried out by a person with suitable expertise and experience.*

Evidence of suitable expertise and experience can be demonstrated by, but is not limited to, membership of a recognised U-value calculation or measurement competency scheme or OCDEA1 or Level 4 non- domestic energy assessor membership, or any other process recognised by Accreditation Schemes/Approved Organisations and Government.

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Is it really as simple as that?

Requirement	Ready?	Required change
EPC apparatus	✅	Conventions only
Measurement tools	✅	None: Tools from multiple manufacturers & ISO9869 standard
Scheme	✅	None: One scheme exists & could be replicated

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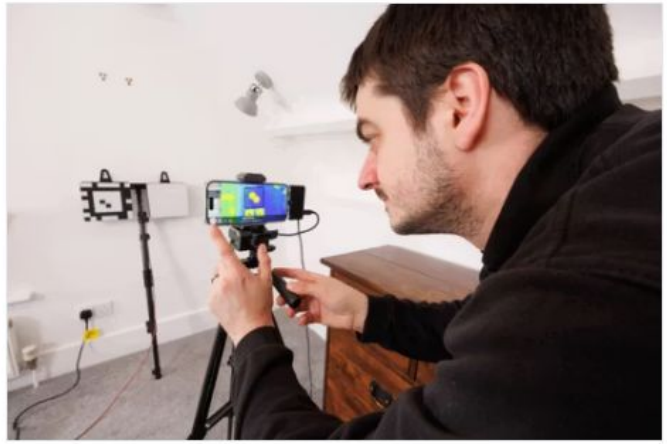
Training

- **U-value training dates:**
  23rd February 2026
  26th March 2026



Who is it designed for?

Everyone from engineers, architects and energy professionals already well versed in U-value calculations through to new users seeking an introduction to measured U-values and looking to unlock the associated opportunities. Suitable for OCDEAs, NDEAs, Retrofit Assessors and Coordinators.

COURSE INFO

Duration: **6 hrs**

Location: **Weedon Bec, NN7 4PS**

Max Persons: **8**

Price

£295 GBP

Diary Dates

- **CONFERENCE:**
  12th February 2026
  Elmhurst National Conference
  Coventry

- **WEBINAR:**
  5th March 2026 @ 1pm
  Embedding Building Performance Measurement
  in Public Sector Projects Through Procurement

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Thank you!

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