energy saving trust

Do U-value Insulation?

The Energy Saving Trust Solid Wall Insulation Field Trial

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embed
building intelligence for innovation

The Solid Wall Insulation Field Trial

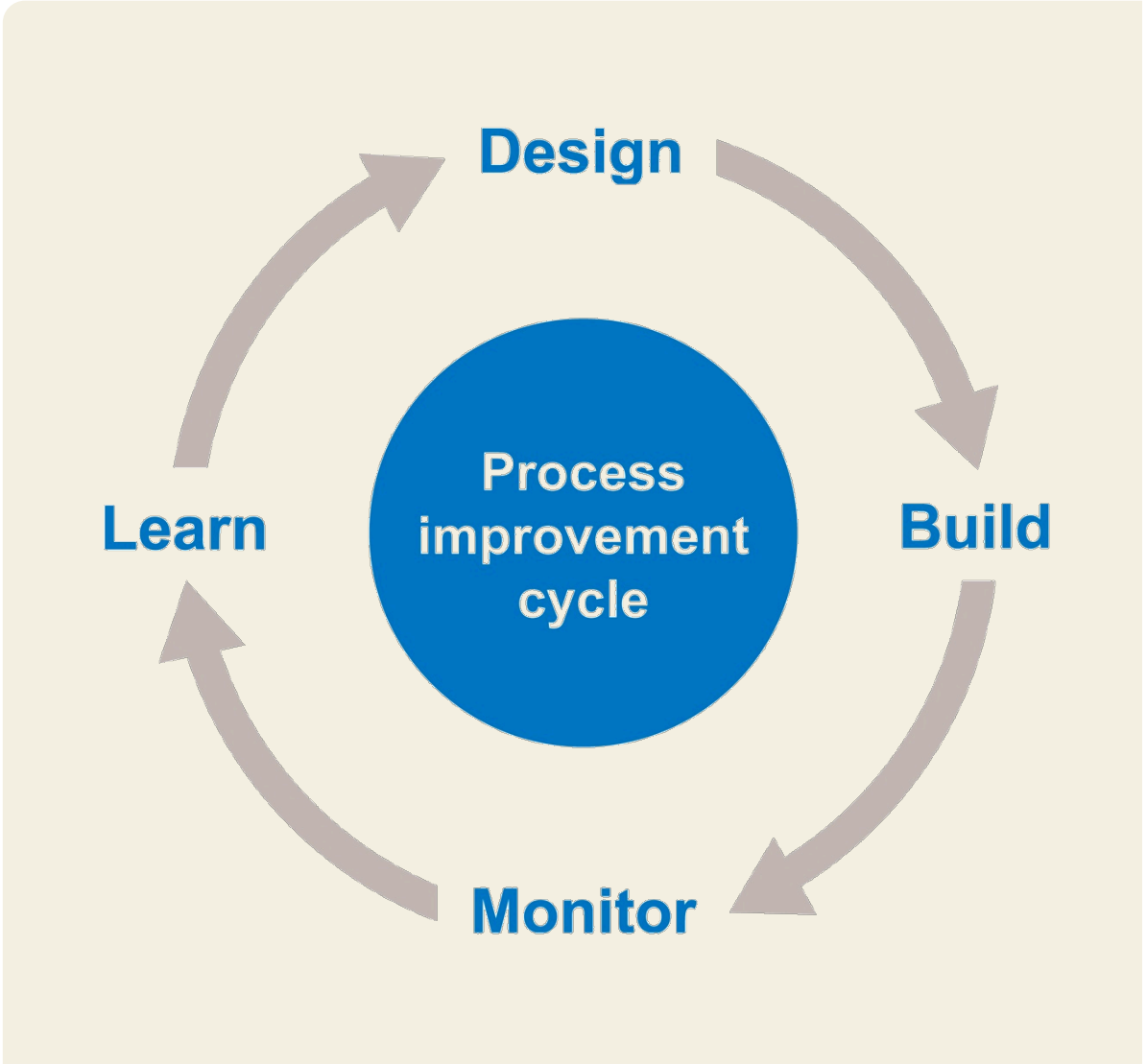
- The importance of data monitoring and dissemination
- Trial overview
- Baseline monitoring results
- Early look at post insulation performance
- EMBED Database

The importance of data and dissemination

- What is actual performance?
- What does and doesn't work
- Ensuring confidence in new products

Feedback loop

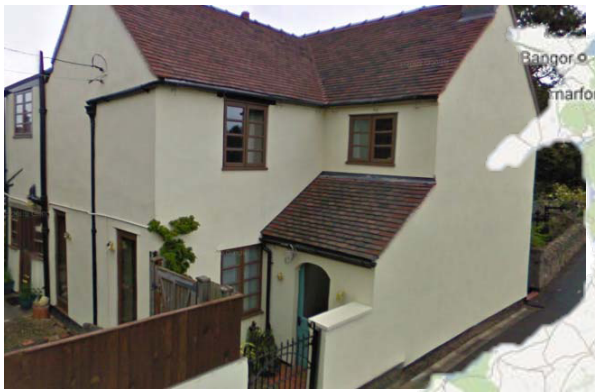
- needs to be closed
- results of feedback acted upon
- learning disseminated to the industry at large



Sample Homes

- 93 Households recruited
- 50 allocated to be insulated
- 36 now insulated

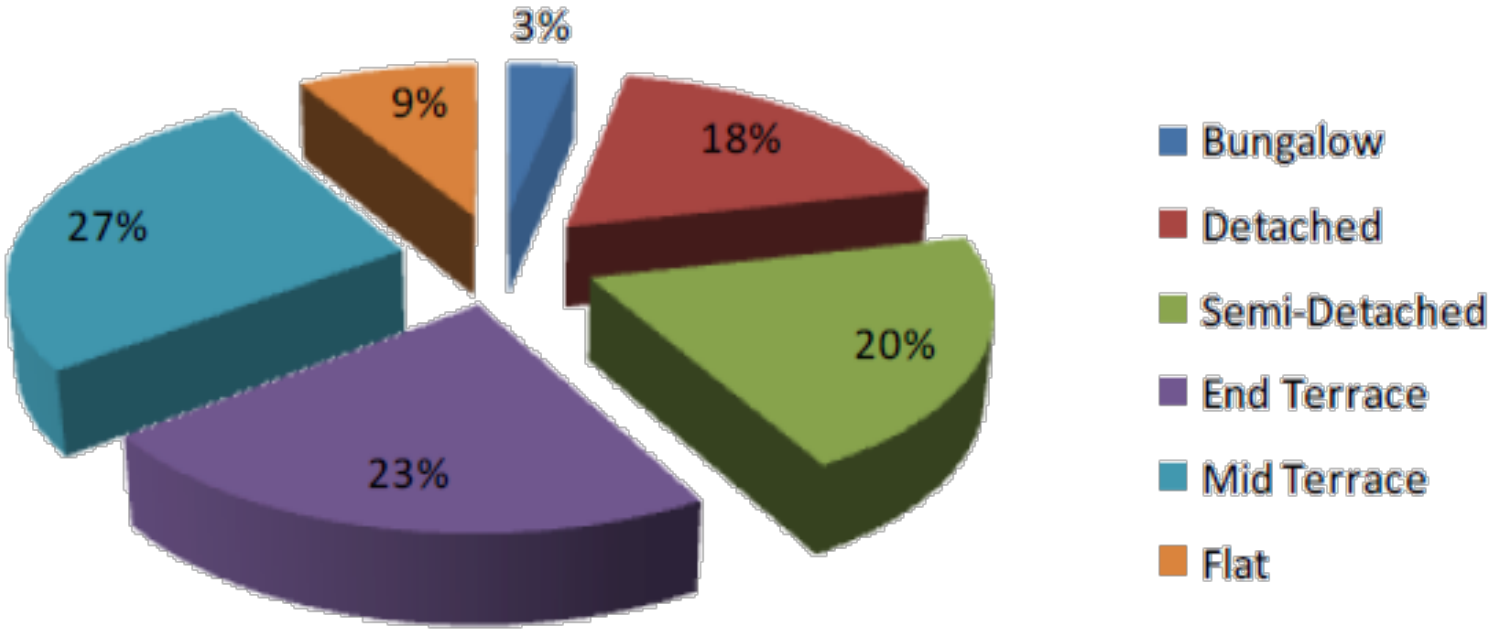







A74(M)
Dumfries
Carlisle
Newcastle Upon Tyne
Blyth
Durham
Workington
Darlington
M6
Harrogate
York
Leeds
Preston
Wakefield
Hull
Barnsley
Grimsby
Scunthorpe
Manchester
Sheffield
Lincoln
Louth
Chester
Colwyn Bay
Boston
Nottingham
Derby
Stoke-on-Trent
Leicester
Peterborough
King's Lynn
Norwich
Corby
M1
A1(M)
Coventry
Redditch
Worcester
Bedford
Cambridge
M40
Hereford
Cheltenham
Gloucester
Milton Keynes
Luton
M11
Colchester
Carmarthen
Merthyr Tydfil
Neath
Cwmbran
Cardiff
Swindon
Oxford
High Wycombe
St Albans
Chelmsford
Southend
M4
Bath
Weston-Super-Mare
Bromley
Croydon
Crawley
Maidstone
Barnstaple
Bridgwater
Taunton
Tiverton
Yeovil
Southampton
Bournemouth
Brighton
M20
Exeter
Newton
Milford
Bangor
Chesterfield
Mansfield
Scunthorpe
Grimsby
Lincoln
Louth
Boston
Wymondham
Beccles
Ipswich
Harrogate
Durham
Darlington
Scarborough
Bridlington
Middlesbrough
Newton Aycliffe
Workington
Preston
Halifax
Huddersfield
Wakefield
Hessle
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Oxford
High Wycombe
St Albans

Property Types



- Planning permission required for 50% of the properties
- No consistent planning approach across local councils
- EWI acceptable without permission in some cases, in others a full application required

Sample Properties




Croft
Cottage
23/3/2011 13:35
RV54


31/3/2011 10:26

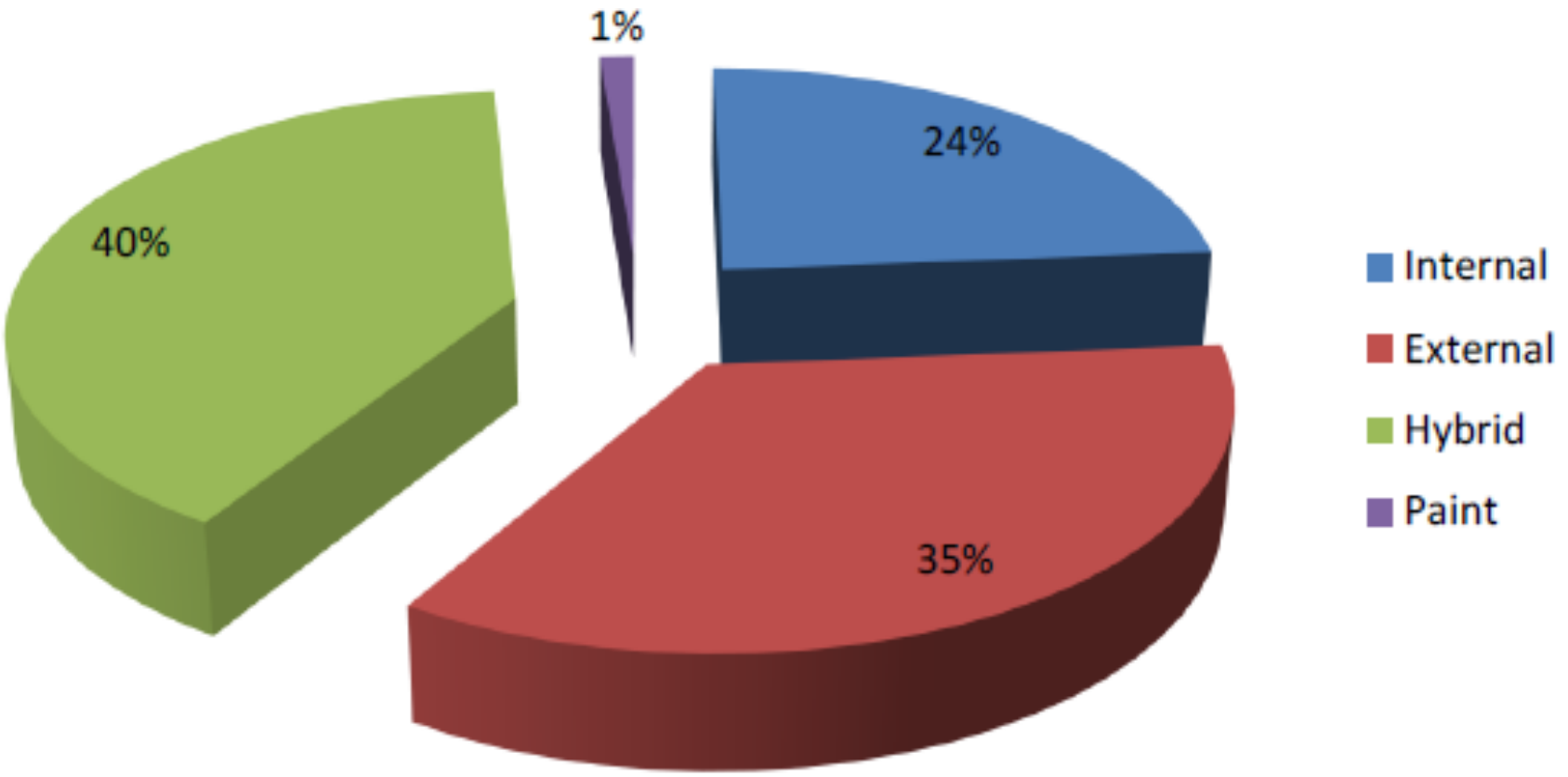




Sample Properties



Insulation methods



Monitoring

Monitoring equipment installed (2010) and spot testing undertaken

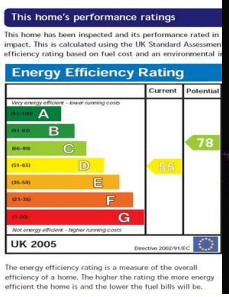
Recorded energy consumption baseline data set

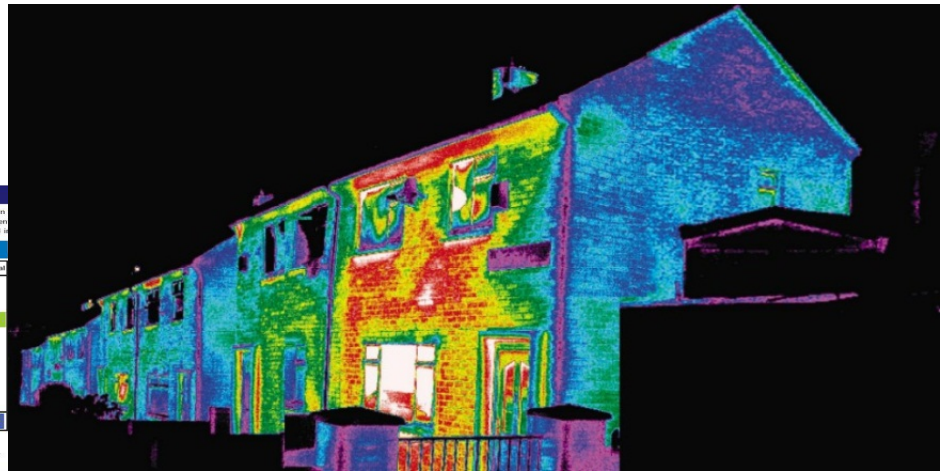
- Smart metering of gas and electricity use
- Internal / external temperatures & humidity
- Wall surface temperature measurement
- Internal / external thermography
- Wall U-value measurements
- Full SAP assessment
- Air tightness test











Baseline Monitoring Results

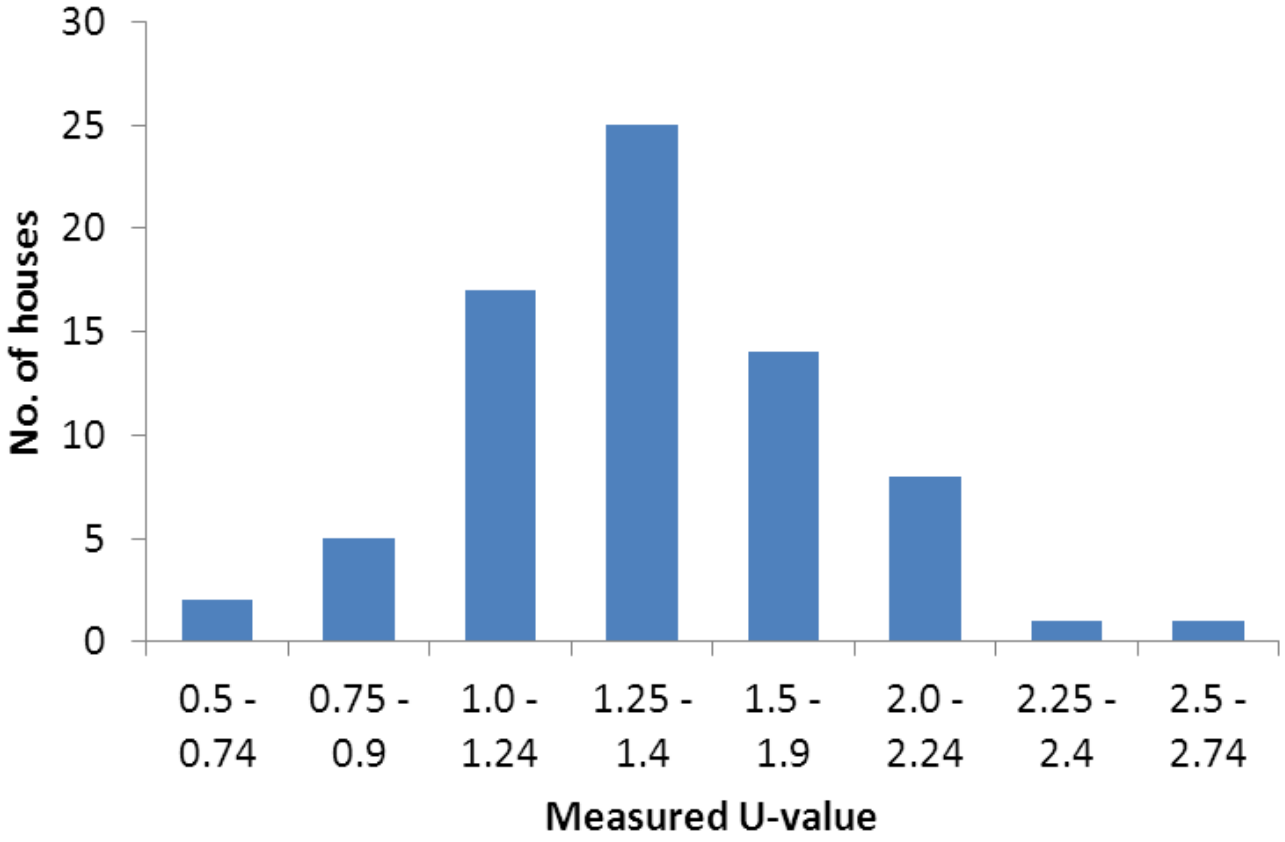
- **Average measured U-Value across the sample = 1.4W/m^{2}K**
  - Domestic energy models predict U-Value of 2.1 for solid walls

- **Average air permeability = 10.1 m^3/h.m^2 (B.Regs requires >10)**
  - All homes have existing double glazing

- Approximately 45% of homes considered to be under-heated (<17^{o}C)
- Humidity only considered to be an issue in a few properties
- Estimated payback period for SWI is an average of 25 years across the sample

Measured U-Values

Measured U-values were considerably better than the value of 2.1W/m²K often assumed for solid brick construction



Measured U-Values

Measured U-values were considerably better than the value of 2.1W/m²K often assumed for solid brick construction

Reflects the diversity of solid wall construction within the housing stock.

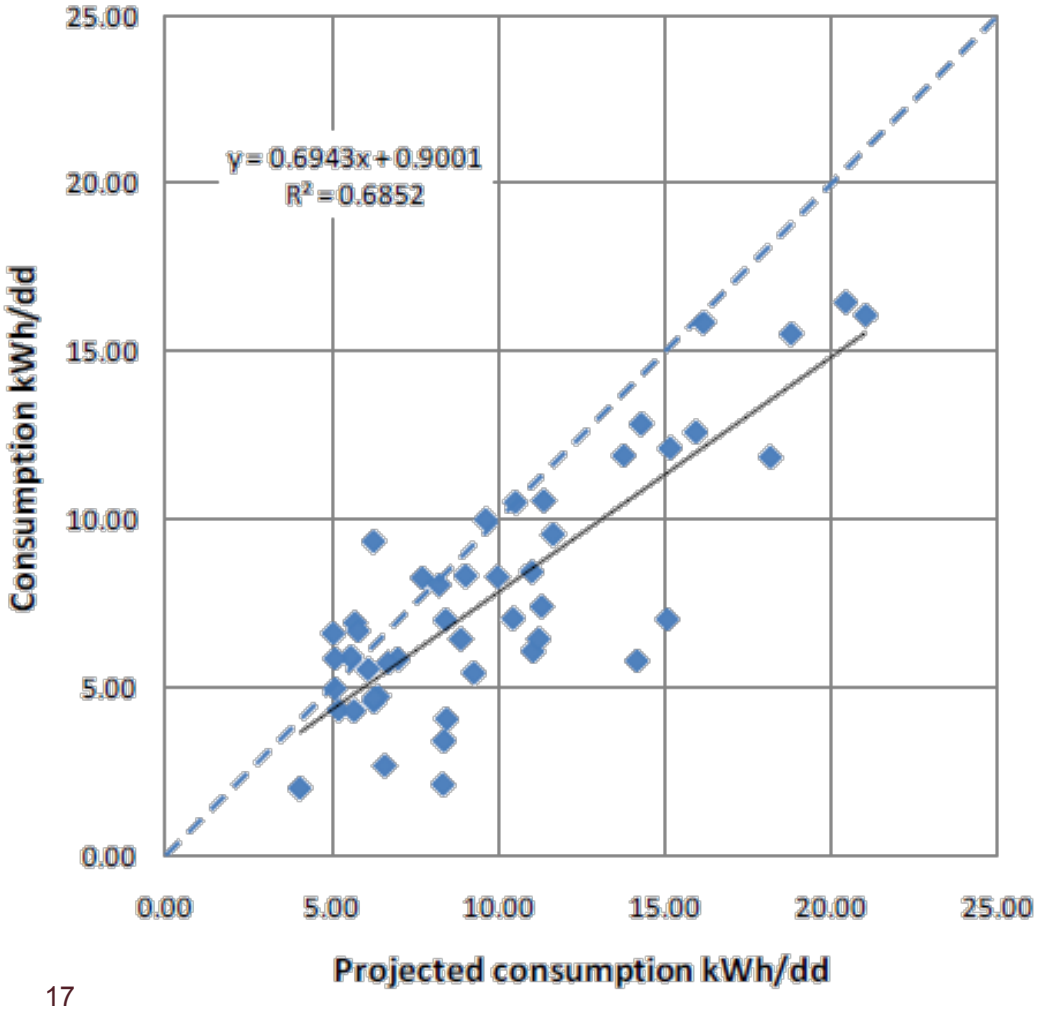
Reasons for the low U-values may include:

- extra thick construction
- Cavities, intentional or fortuitous e.g. between stone and brick
- insulating elements e.g. wood in historical construction
- post construction improvement e.g. dry lining, insulating plaster etc.

Statistical measure	Measured U-value (W/m²K)
Average	1.43
Median	1.40
Max	2.52
Min	0.64

Each solid wall property needs to be individually evaluated to estimate the potential benefits of increased insulation as these may vary widely.

Energy use vs. Modelled heating requirement



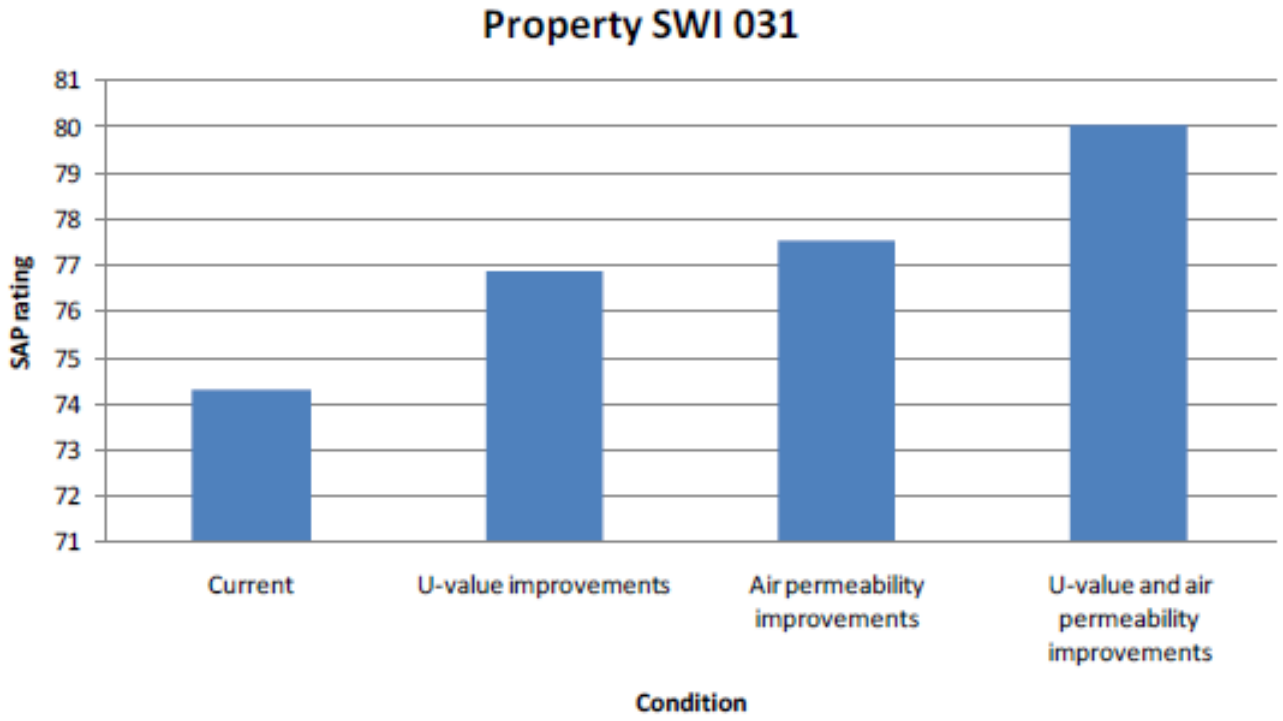
Actual energy consumption less than prediction based on SAP heat loss coefficient

Possible reasons:

- Dwelling not heated continuously
- Dwelling may be heated to lower temperature than assumed in the degree day calculation
- Unrecorded use of supplementary heating
- Uncertainties in U-value

The importance of Air tightness?

- U-value improvements delivered greater benefits when compared to improvements in the air permeability alone
- However, where air permeability exceeded 20.0 $m^3/h.m^2$, air permeability improvements were more significant

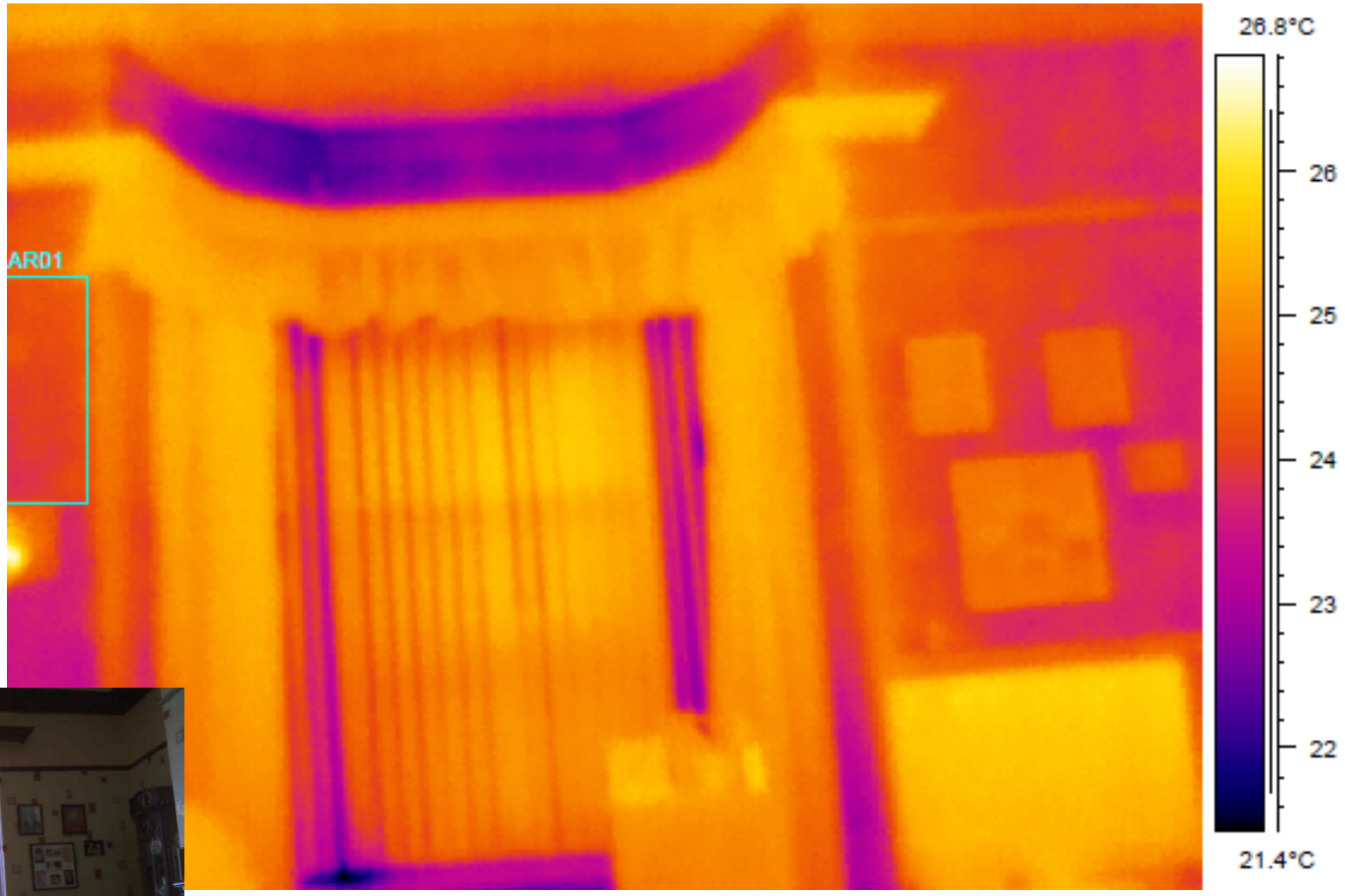


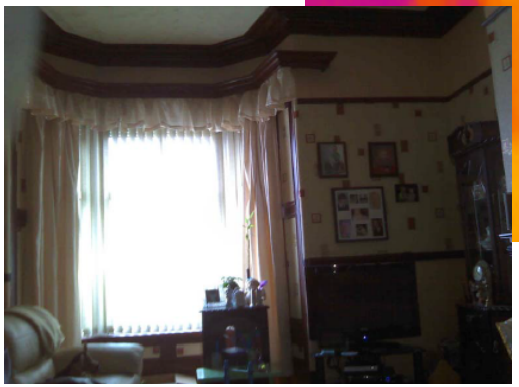
Early post insulation performance

- **Average energy saving across insulated properties 20%**
  - Highest saving 43% with no change to internal temperatures
  - 2 properties had higher consumption but 10% higher internal temperatures
- **Change in internal temperature -7% to 14% (average +0.5^{o}C)**
- **Average post insulation U-Value across the sample = 0.44W/m^{2}K**
  - UK building regulation requires U-Values of 0.3 for new build houses
- **Average air permeability = 9.7 m^{3}/h.m^{2}**
  - Range from 60% improvement to 50% increase in air permeability

Pre Insulation

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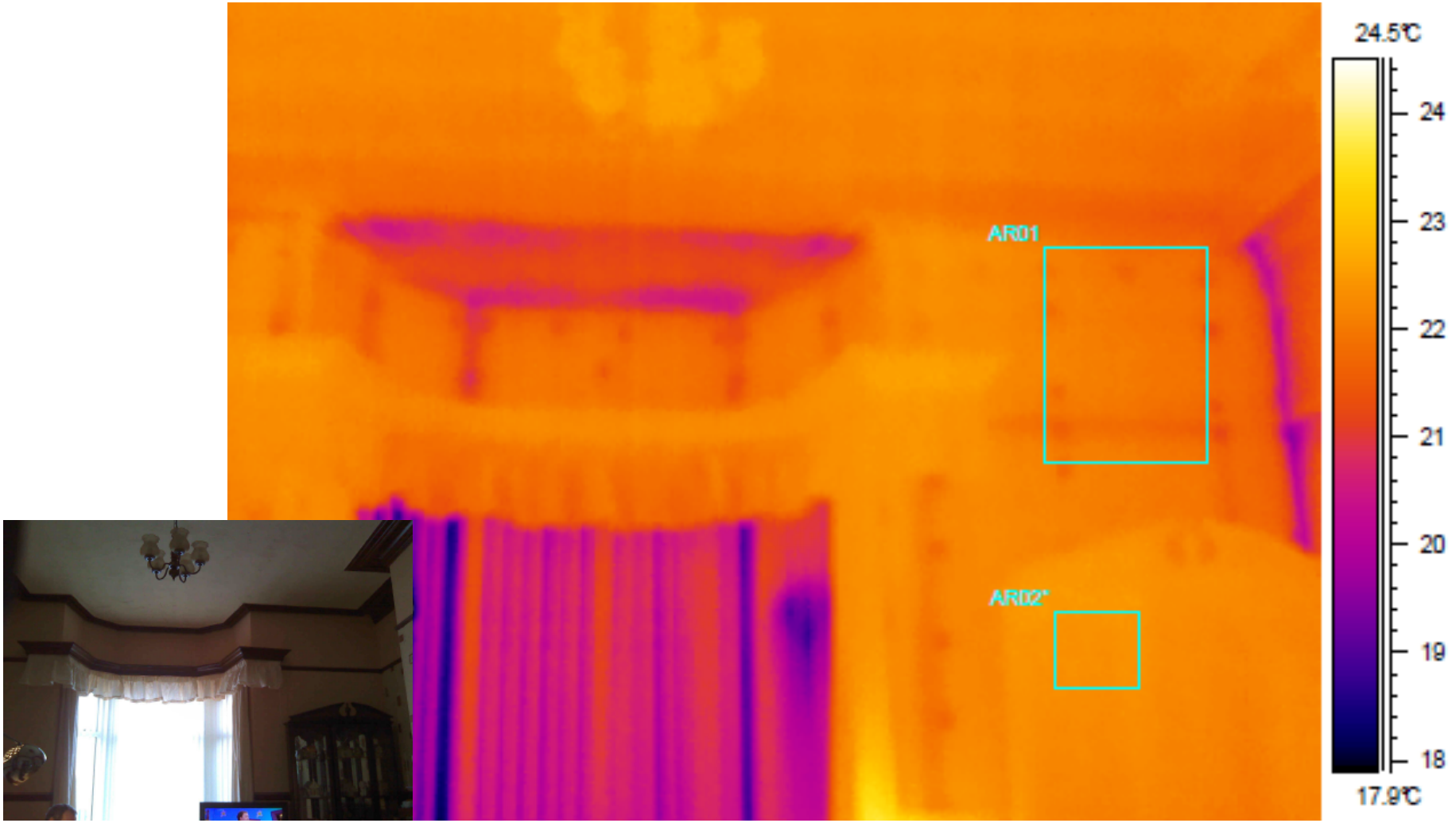




Post Insulation

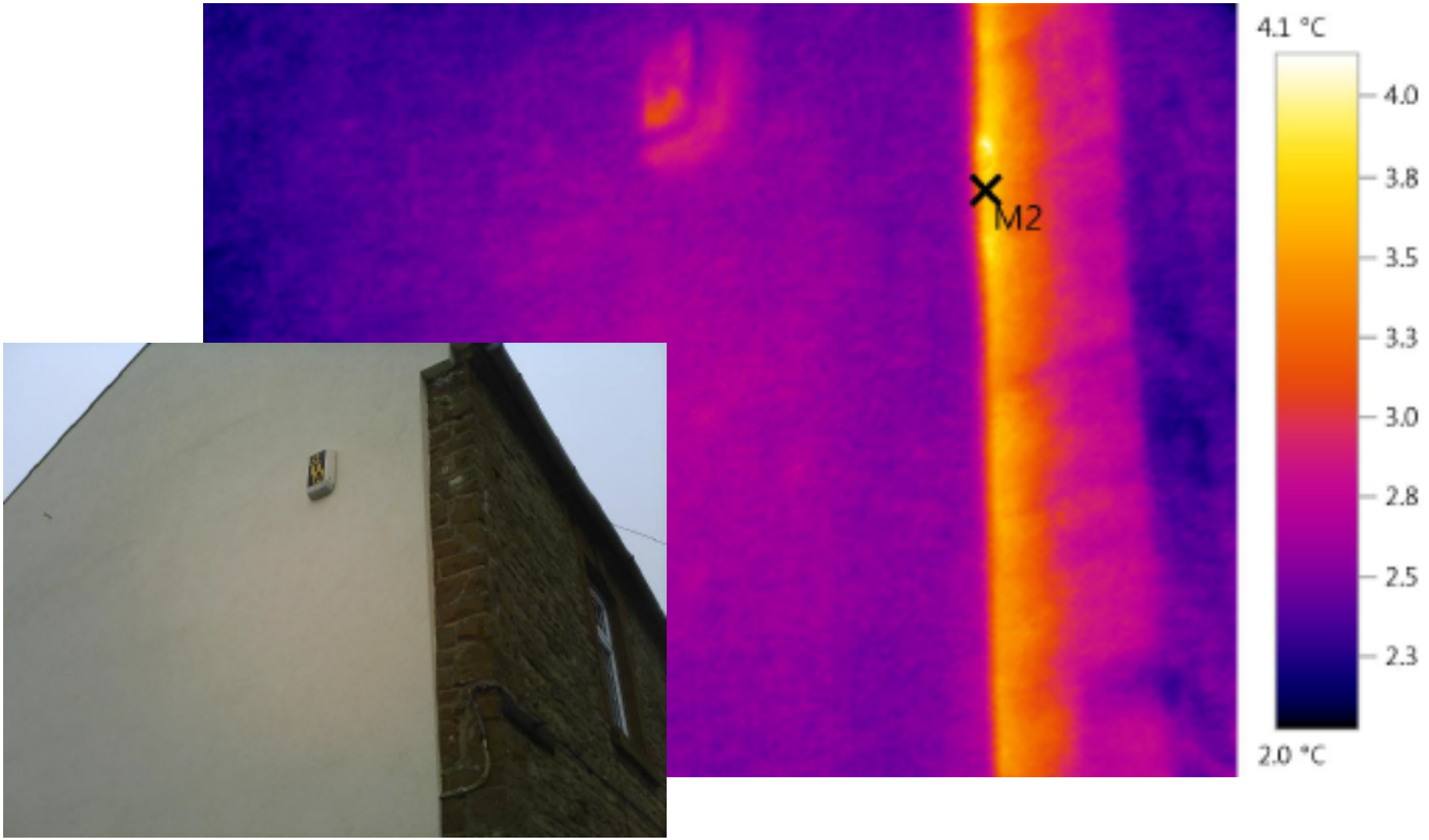
Un-insulated top of bay window

Insulation fixings causing cold bridging



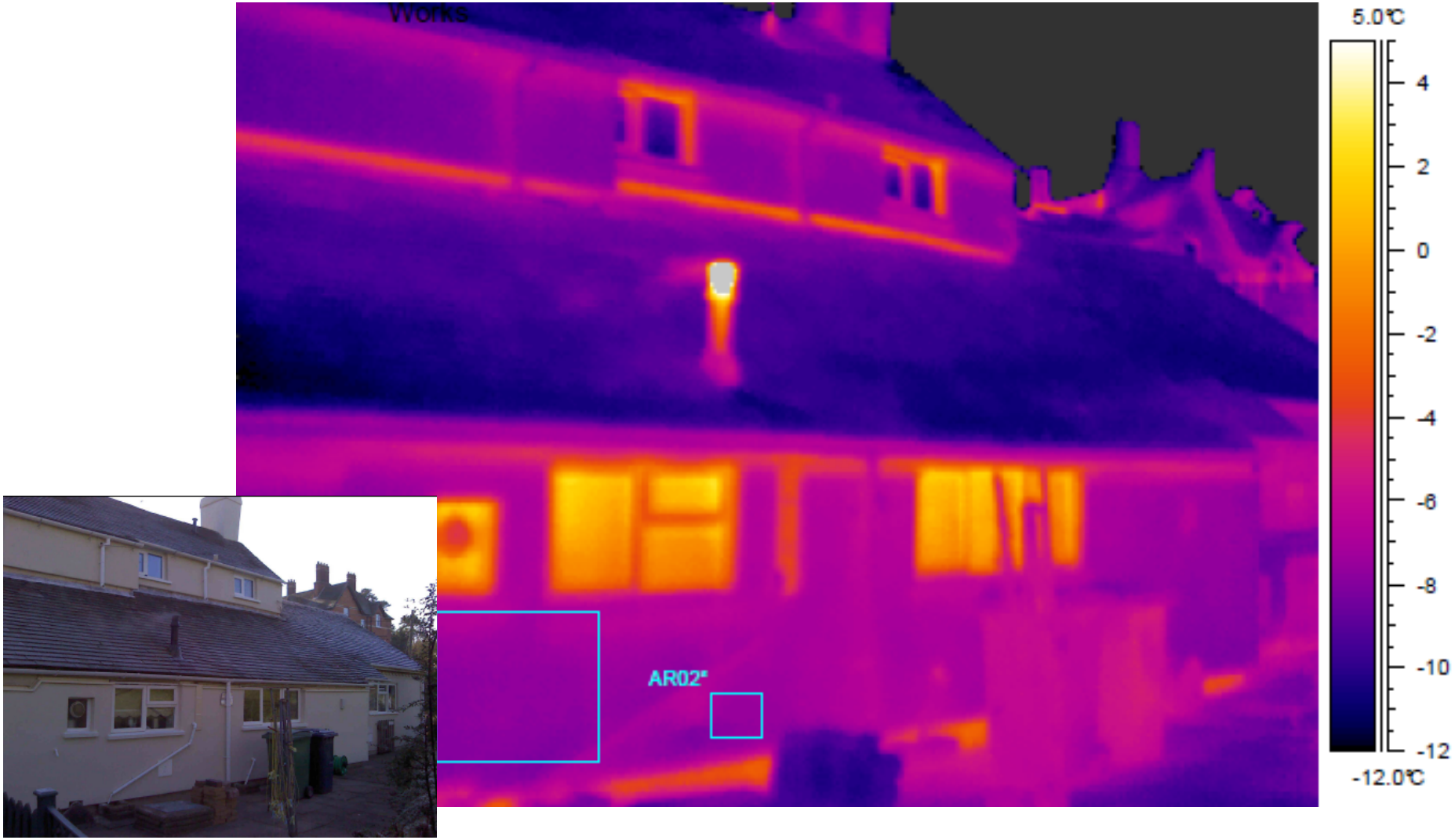
Post Insulation

Heat Leakage at junctions of walls



Post Insulation

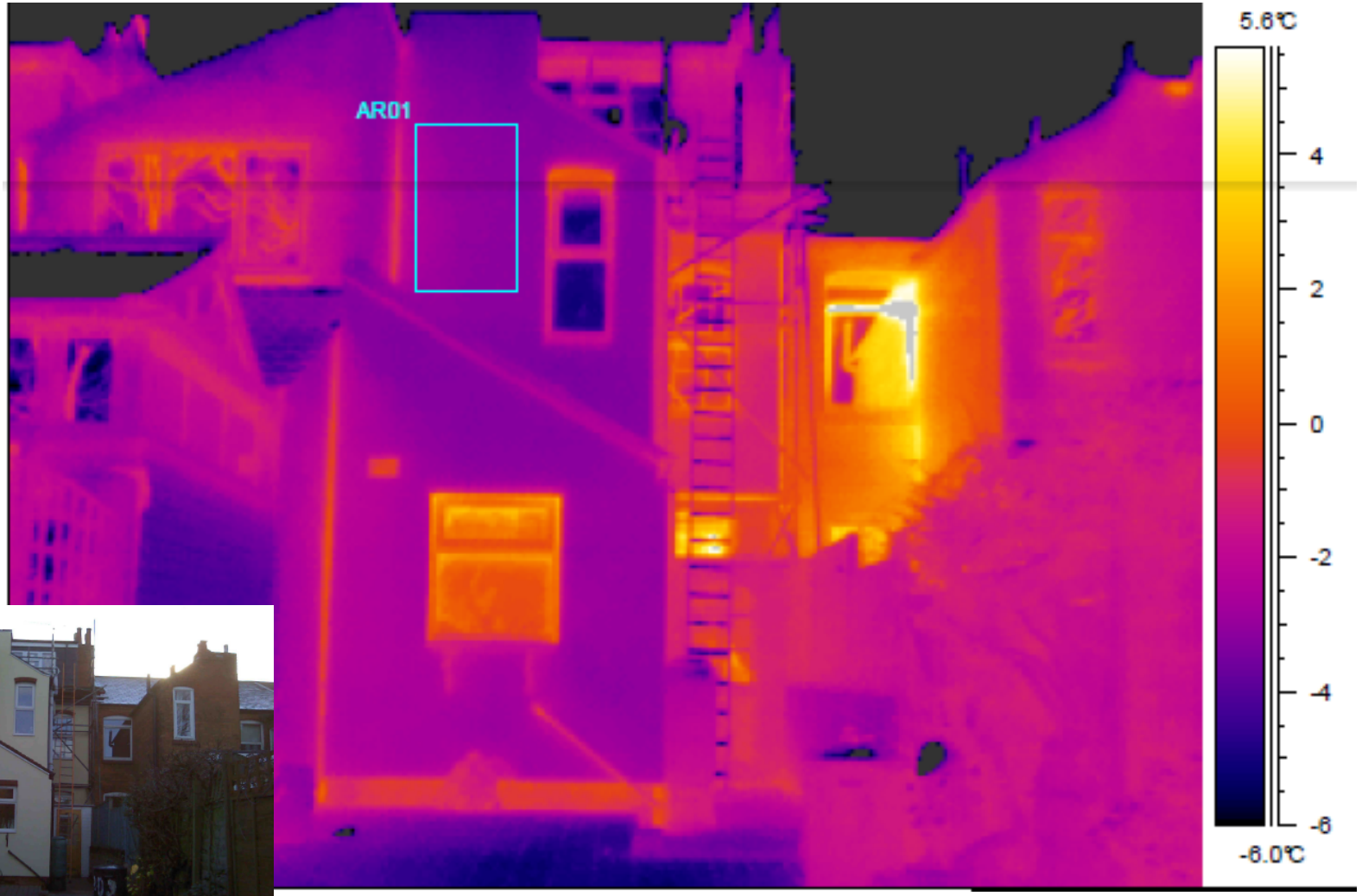
Heat loss at base of the wall



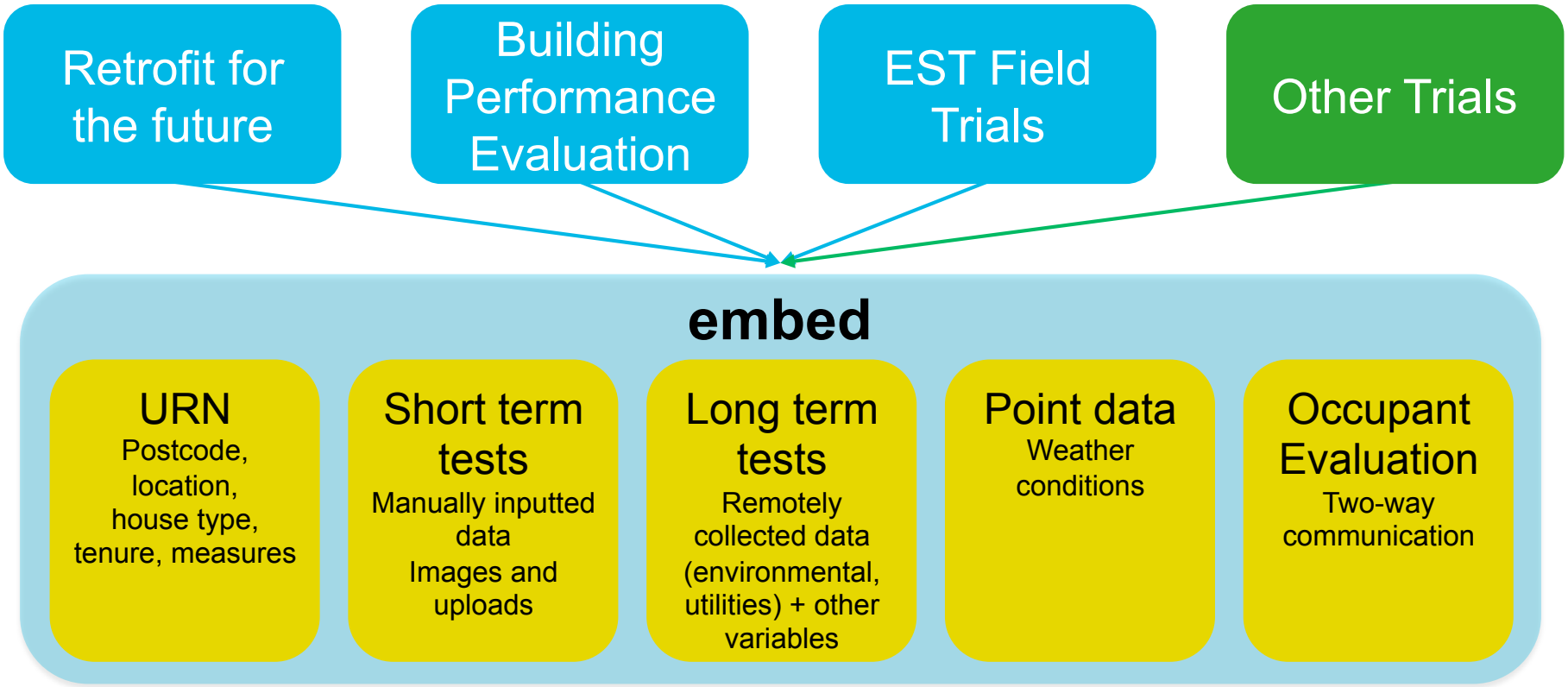
Post Insulation

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Heat loss at base of the wall



EMBED monitoring database



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Thank you

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