



LEEDS
BECKETT
UNIVERSITY

Citation:

Miles-Shenton, D (2015) Airtightness testing and thermographic analysis of 20 WDH dwellings - Nov '14 to Feb '15. In: Wakefield Affordable Warmth Action Plan, Wakefield. (Unpublished)

Link to Leeds Beckett Repository record:

<https://eprints.leedsbeckett.ac.uk/id/eprint/5065/>

Document Version:

Conference or Workshop Item (Presentation)

The aim of the Leeds Beckett Repository is to provide open access to our research, as required by funder policies and permitted by publishers and copyright law.

The Leeds Beckett repository holds a wide range of publications, each of which has been checked for copyright and the relevant embargo period has been applied by the Research Services team.

We operate on a standard take-down policy. If you are the author or publisher of an output and you would like it removed from the repository, please [contact us](#) and we will investigate on a case-by-case basis.

Each thesis in the repository has been cleared where necessary by the author for third party copyright. If you would like a thesis to be removed from the repository or believe there is an issue with copyright, please contact us on openaccess@leedsbeckett.ac.uk and we will investigate on a case-by-case basis.

Dominic Miles-Shenton

Senior Research Fellow, Leeds Beckett University

Airtightness testing and thermographic analysis of 20 WDH dwellings – Nov '14 to Feb '15

Wakefield Affordable Warmth Action Plan

WDH

Tues 29th September 2015

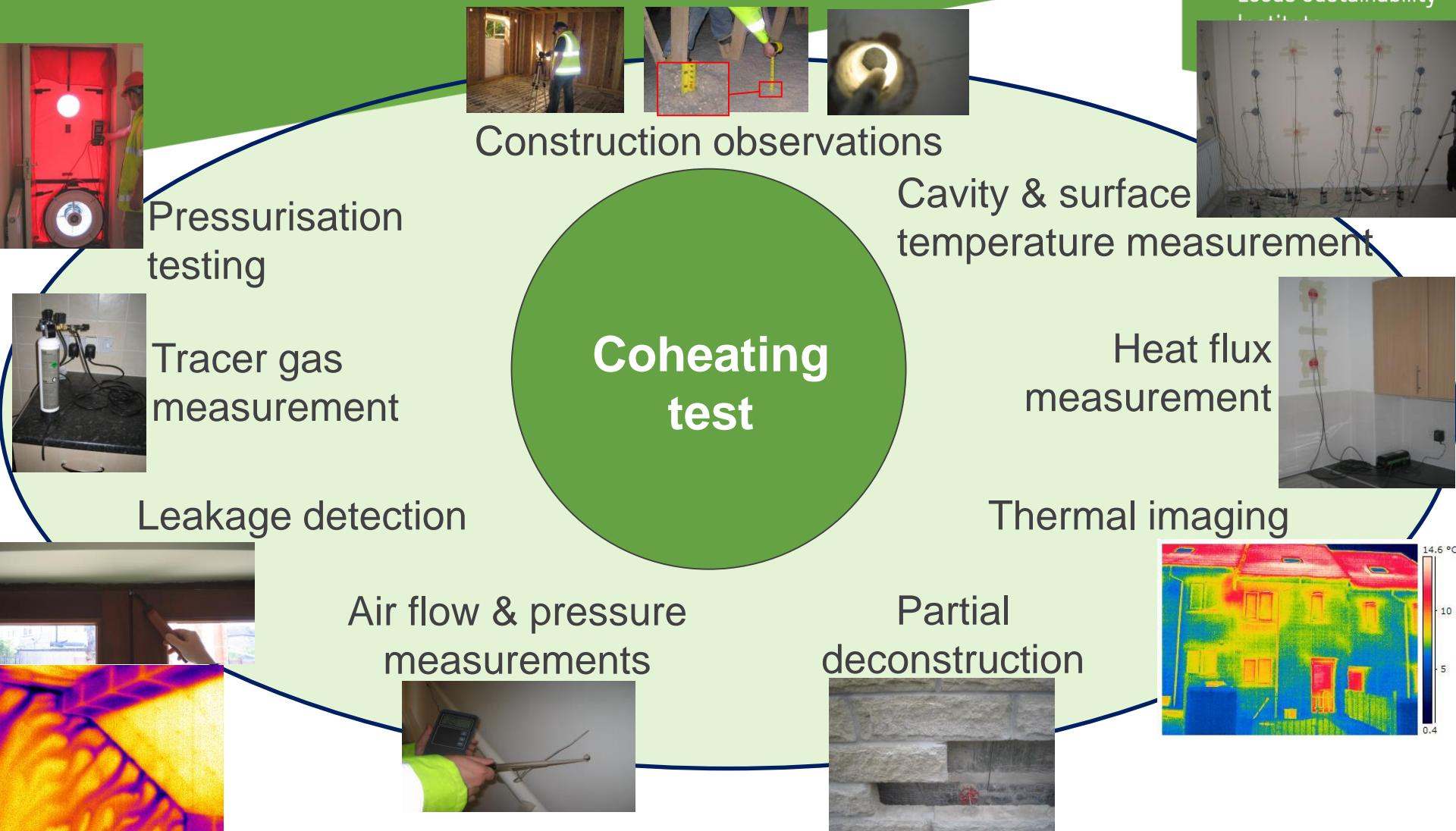


Leeds Sustainability
Institute

Airtightness testing and thermographic analysis of 20 WDH dwellings:

- **Introduction - Who are LSi and what do we do?**
- **Airtightness testing results**
- **Observations - BISF houses**
- **Observations - Solid-wall masonry houses**
- **Summary**

Leeds Sustainability Institute: Measurement & analysis of fabric performance



Airtightness testing and thermographic analysis of 19 WDH dwellings:

- **Tests conducted in Nov/Dec 2014 & Feb 2015**
- **Airtightness tests with thermographic leakage detection under dwelling depressurisation**
- **Houses at Flanshaw, Kelsey & Knottingley**
- **Mixed tenure – social housing & owner occupied**
- **15 BISF houses - 14 with EWI, 1 without**
- **5 Solid-wall masonry houses - 2 with EWI, 3 without (1 no-test)**

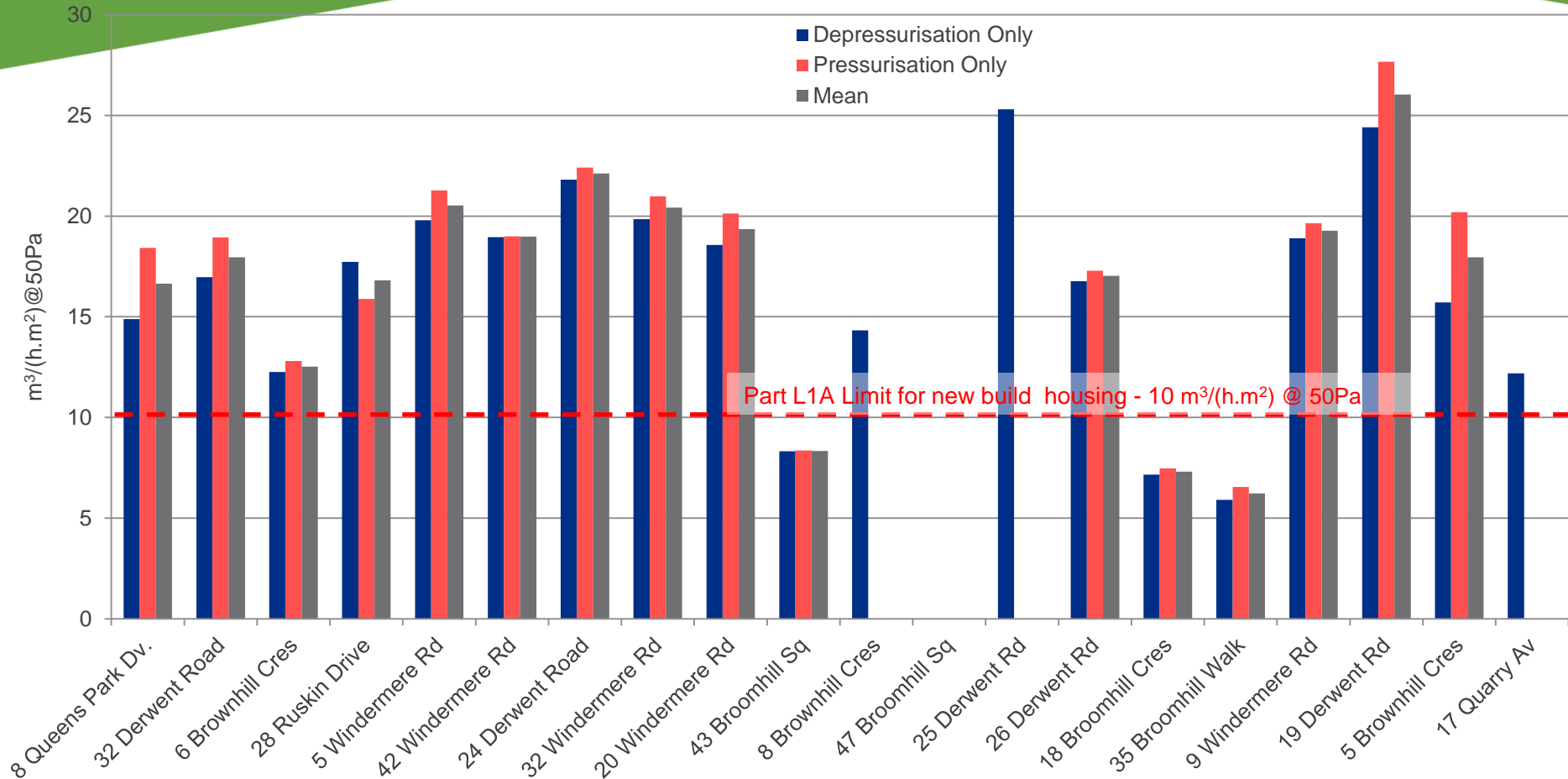
Airtightness testing and thermographic analysis of 19 WDH dwellings: BISF Houses



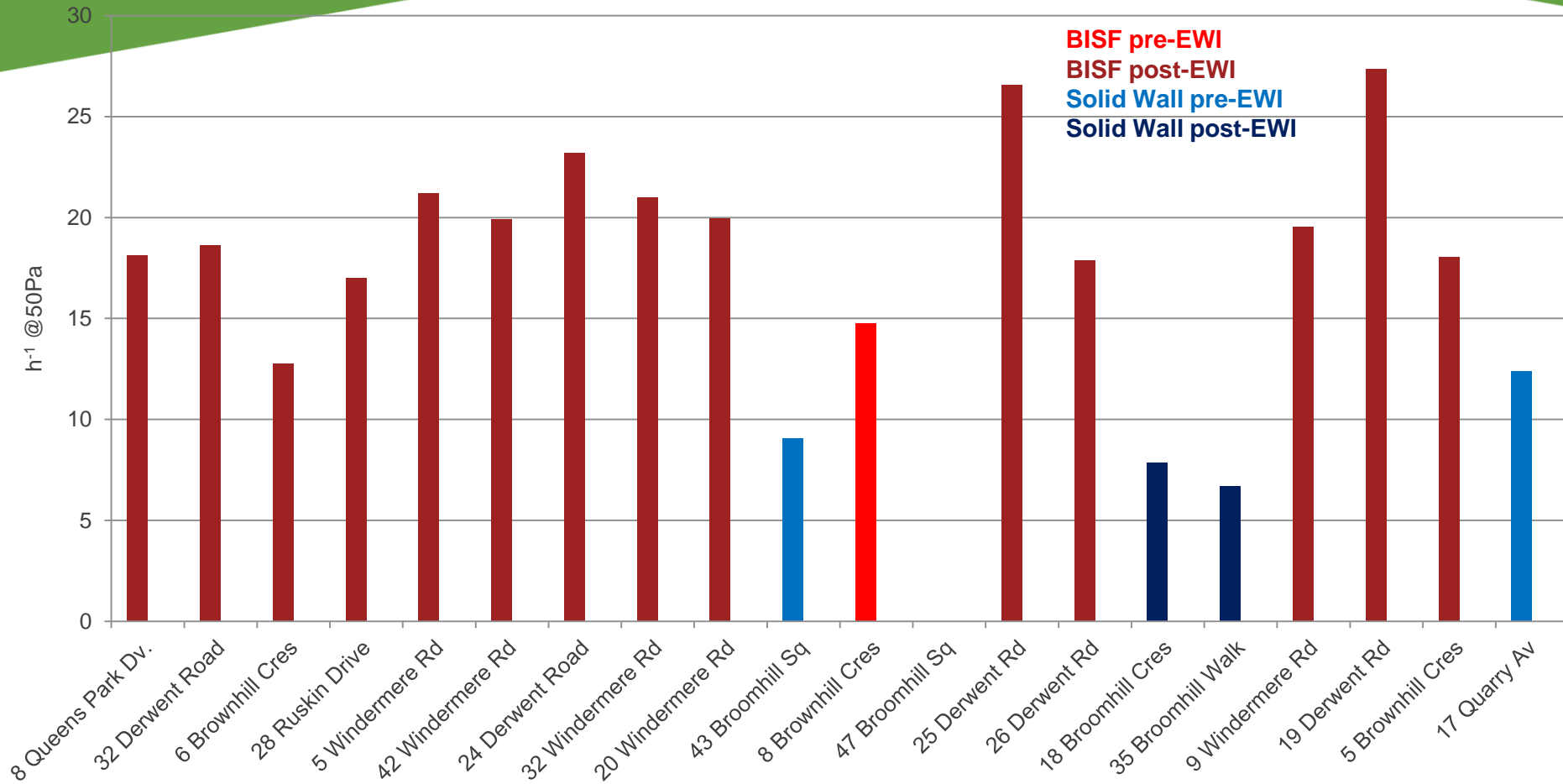
Airtightness testing and thermographic analysis of 19 WDH dwellings: Solid-wall Masonry Houses



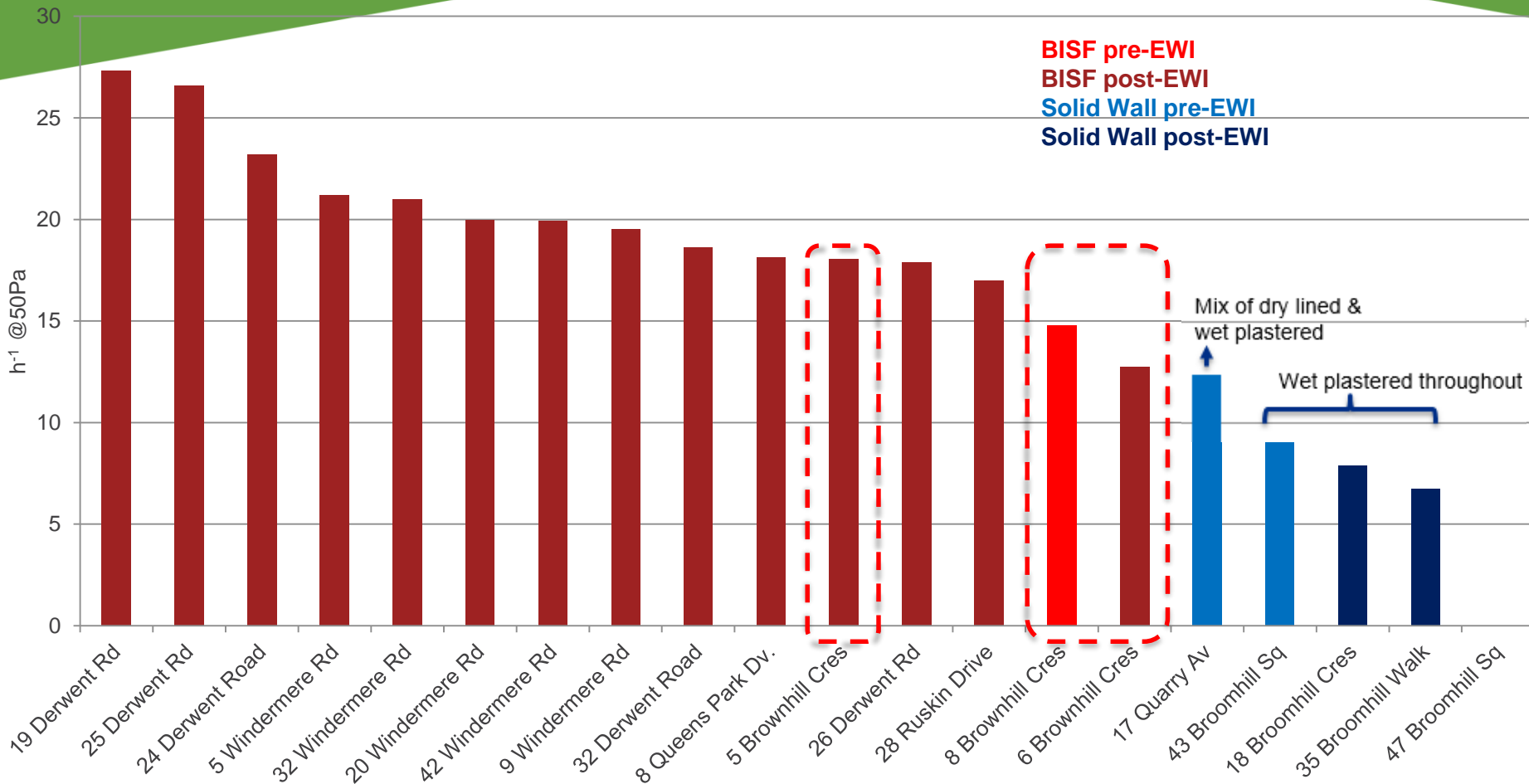
Airtightness testing results: Air permeability



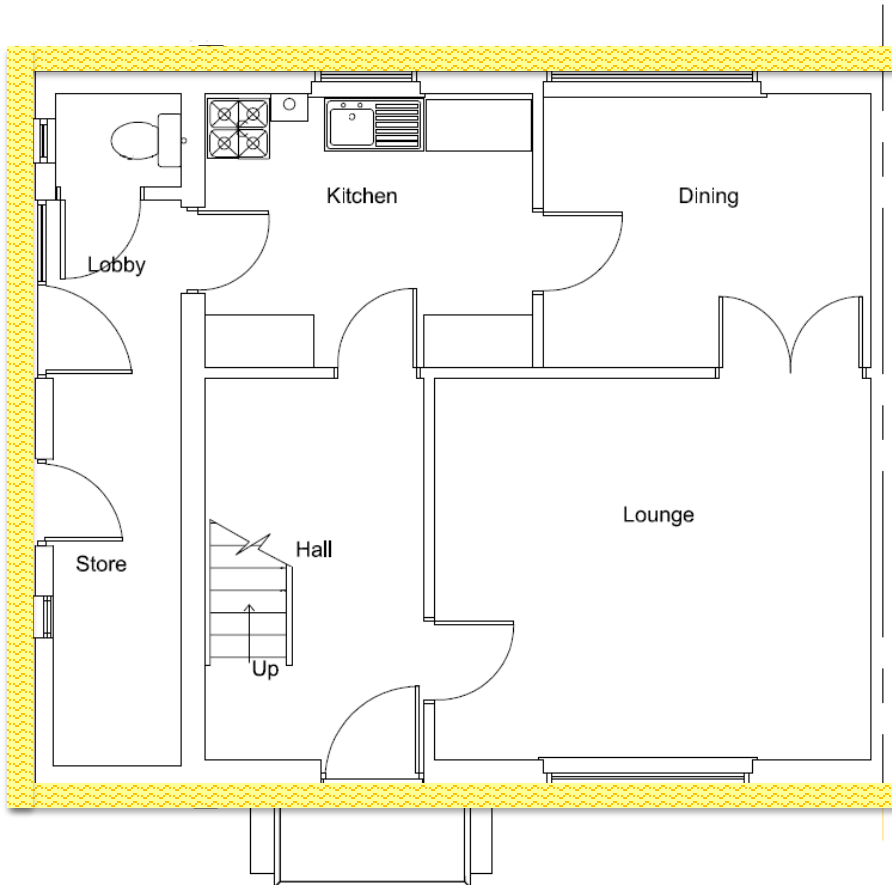
Airtightness testing results: Air leakage rate (mean)



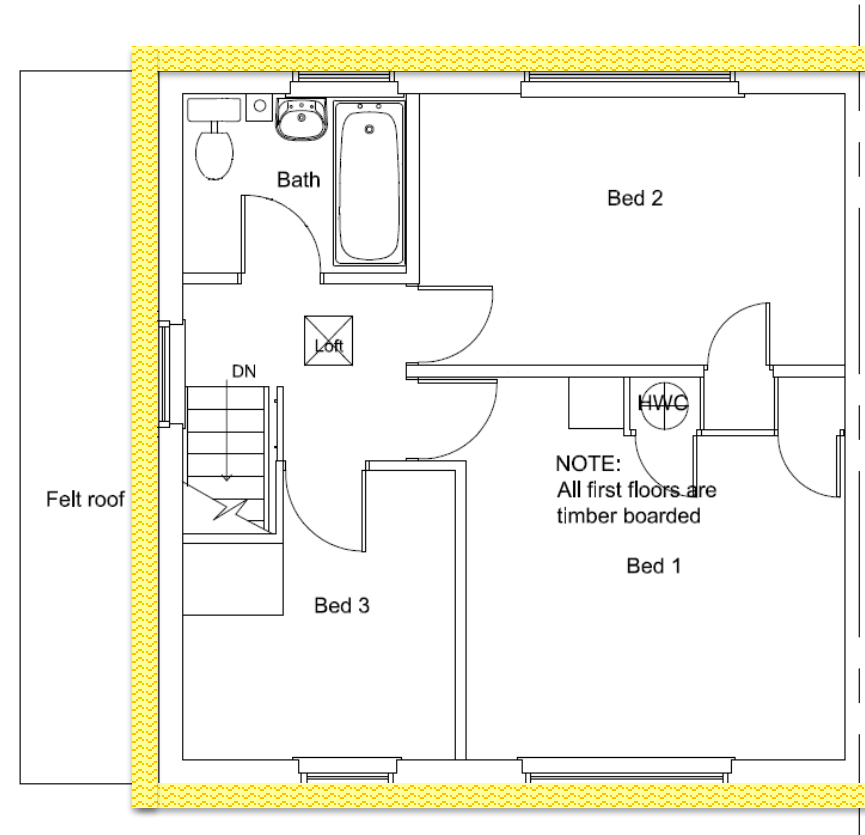
Airtightness testing results: Air leakage rate



Airtightness testing: BISF houses



Ground Floor

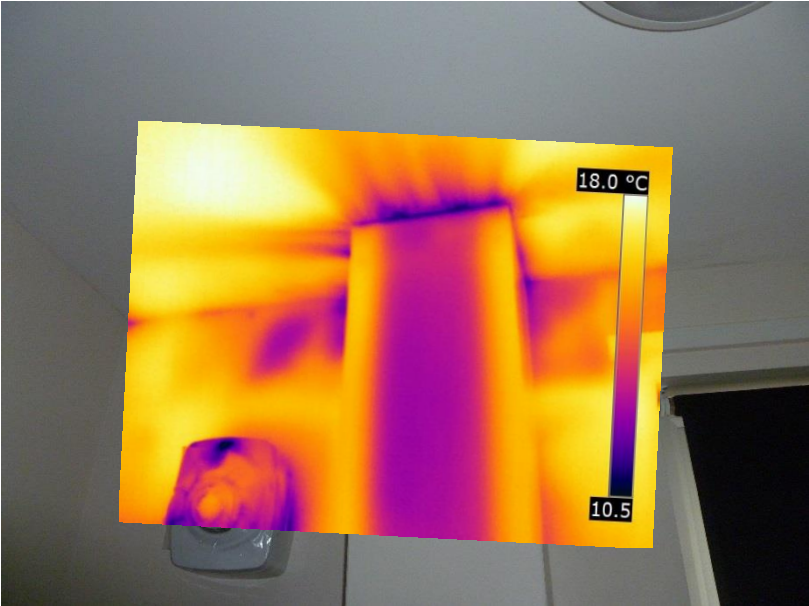
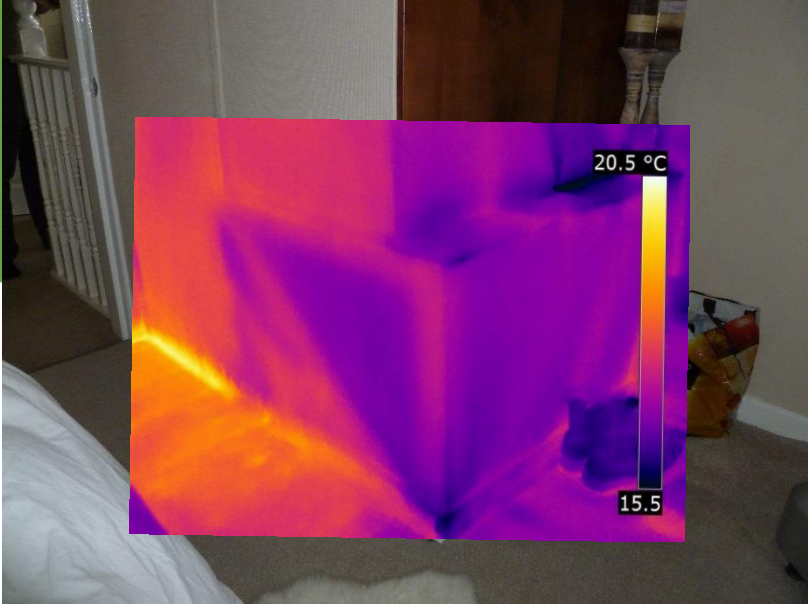


First Floor

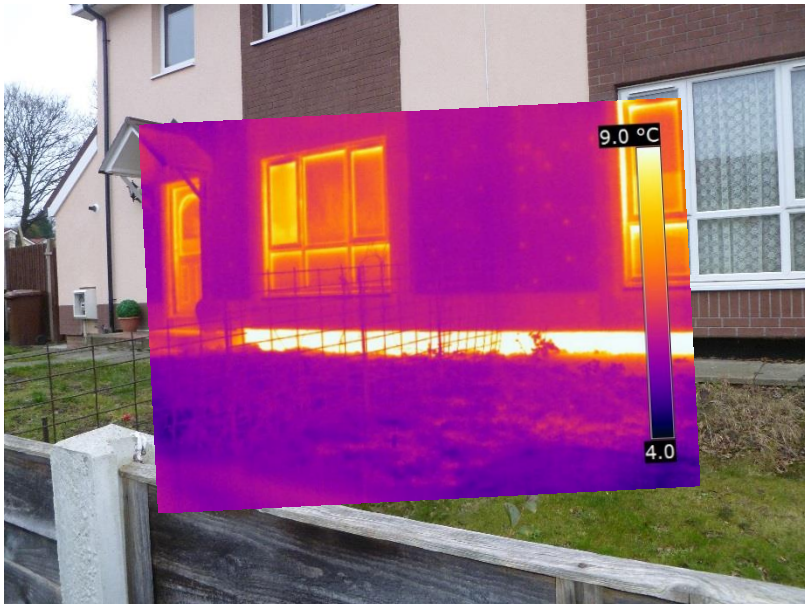
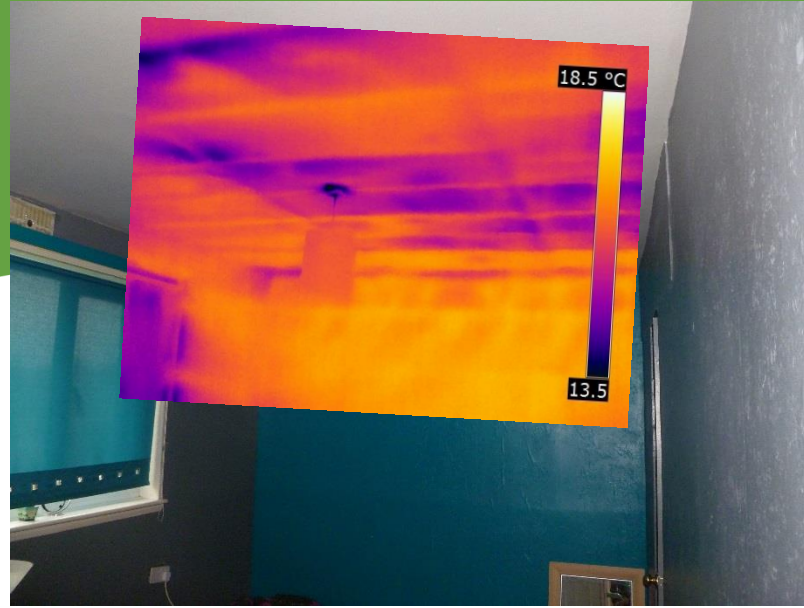
Airtightness testing: BISF houses



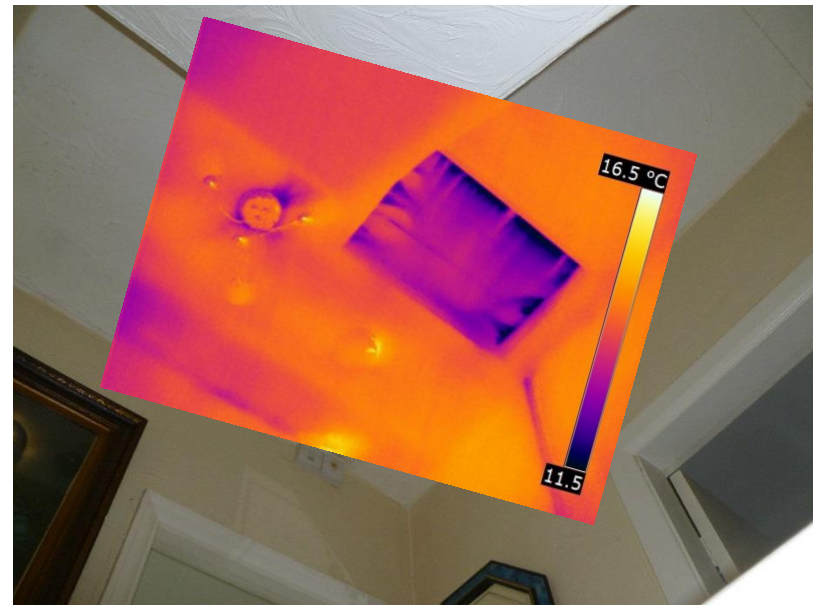
Airtightness testing: BISF houses



Airtightness testing: BISF houses



Airtightness testing: Solid-wall masonry houses



Airtightness testing results: Solid-wall masonry houses



Airtightness testing: Solid-wall masonry houses



Thermographic surveys:

Temperature factor - f_{Rsi}

- Using thermography to determine the severity of thermal anomalies
- Temperature Factor $\rightarrow f_{Rsi} = \frac{(T_{Surface} - T_{ExtAmb})}{(T_{IntAmb} - T_{ExtAmb})}$
- For steady-state models: If $f_{Rsi} < 0.75$, high risk of surface condensation can easily be misinterpreted: surface properties, thermal mass, moisture, etc.
- Examples: $T_i=21^{\circ}\text{C}$, $T_e=5^{\circ}\text{C}$, $f_{Rsi} < 0.75$ where $T_s < 17^{\circ}\text{C}$
 $T_i=21^{\circ}\text{C}$, $T_e=10^{\circ}\text{C}$, $f_{Rsi} < 0.75$ where $T_s < 18.25^{\circ}\text{C}$

Thermographic surveys:

Temperature factor - f_{Rsi}

$T_i=17.7^{\circ}\text{C}$, $T_e=5.9^{\circ}\text{C}$, $f_{Rsi} < 0.75$ where $T_s < 14.7^{\circ}\text{C}$

Leeds Sustainability
Institute



Airtightness testing and thermographic analysis of 20 WDH dwellings:

Summary:

- **EWI – Aesthetic improvements**
 - Benefits beyond energy performance?
- **Airtightness testing results**
 - No obvious airtightness strategy – needs reviewing for future renovations, particularly of BISF properties.
- **BISF houses**
 - Improved conductive heat loss (lower U-values) means ventilation heat loss becomes proportionally more important.
- **Solid-wall houses**
 - Improved plain-element conductive heat loss means thermal bridging becomes proportionally more important.