LEEDS METROPOLITAN UNIVERSITY
Leeds Sustainability Institute

CeBE

IEA Annex 58 Webinair:
'Coheating methods'

'Coheating Testing in the UK'

Dr David Johnston & Dominic Miles-Shenton
Centre for the Built Environment (CeBE)

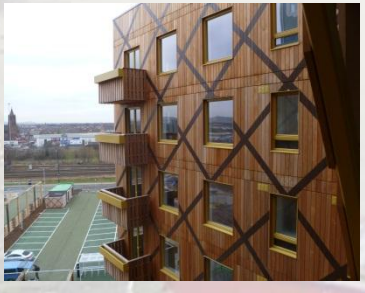
LEEDS METROPOLITAN UNIVERSITY
Leeds Sustainability Institute

CeBE

Coheating test - LeedsMet's experience

Leeds Metropolitan University have undertaken **in excess** of **50 coheating tests** – more than any other organisation in the UK.

- **First test undertaken in the early 1990's as part of the York Energy Demonstration Project.**
- **Majority of the tests have been undertaken over the last 8 years or so.**
- **Tests have been undertaken on a range of dwelling forms and construction types.**
- **Tests undertaken in existing as well as new dwellings.**
- **Tests have been used to measure the impact of various fabric improvement interventions, such as external wall insulation.**
- **Test have been undertaken under controlled conditions.**
- **Repeat tests have been undertaken on a number of dwellings.**





LEEDS METROPOLITAN UNIVERSITY
Leeds Sustainability Institute

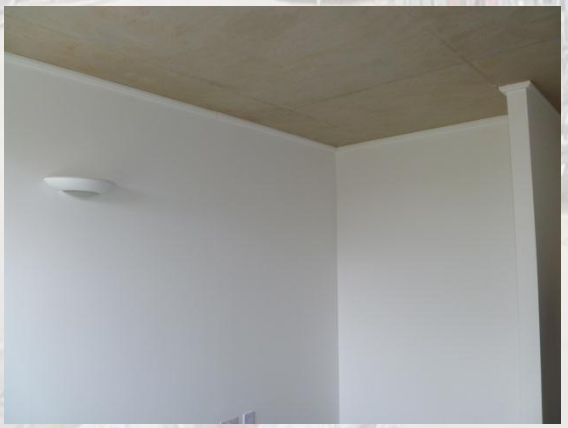
CeBE

Coheating test - LeedsMet's experience

Not all of the tests have been successful!

For example:

- **Difficulties isolating communal heating.**
- **Test undertaken during unseasonally high levels of solar insolation.**
- **Despite interventions being made, only 11 days of useable data out of 76 days of testing!**
- **Although the apartment was guarded, there was significant heat transfer through the concrete frame of the building.**

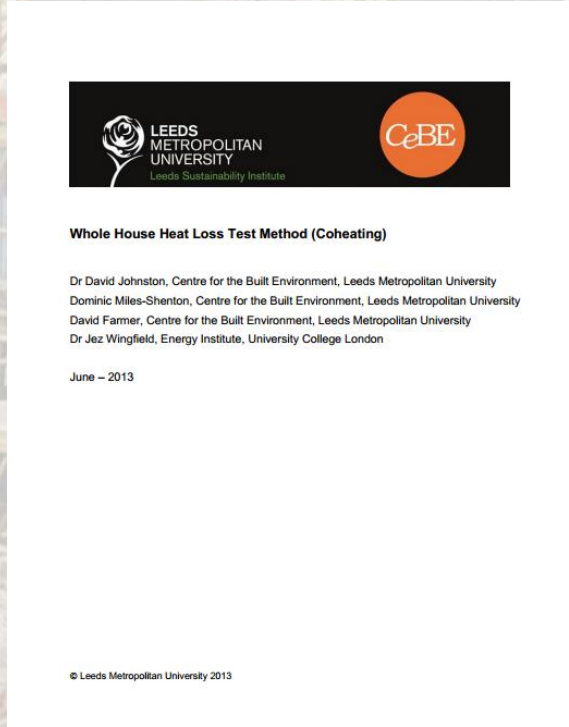


Coheating test - LeedsMet Testing Protocol

Devised in **2010** (Wingfield et al., 2010) and **adopted** as part of the UK Governments **Technology Strategy Board's Building Performance Evaluation Programme**. A **revised version** (Johnston et al., 2013) has been presented to **IEA Annex 58**.

Latest version of the protocol contains information on:

- **Data analysis techniques.**
- **Disaggregation of heat loss components.**
- **Issues to consider.**
- **Equipment required.**
- **Location and numbers of equipment.**
- **Test procedure.**
- **Combining techniques.**
- **Alternative test procedure.**



Whole House Heat Loss Test Method (Coheating)

Dr David Johnston, Centre for the Built Environment, Leeds Metropolitan University
Dominic Miles-Shenton, Centre for the Built Environment, Leeds Metropolitan University
David Farmer, Centre for the Built Environment, Leeds Metropolitan University
Dr Jez Wingfield, Energy Institute, University College London

June – 2013

© Leeds Metropolitan University 2013

Available from:
http://www.leedsmet.ac.uk/as/cebe/projects/cebe_coheating_test_method_june2013.pdf

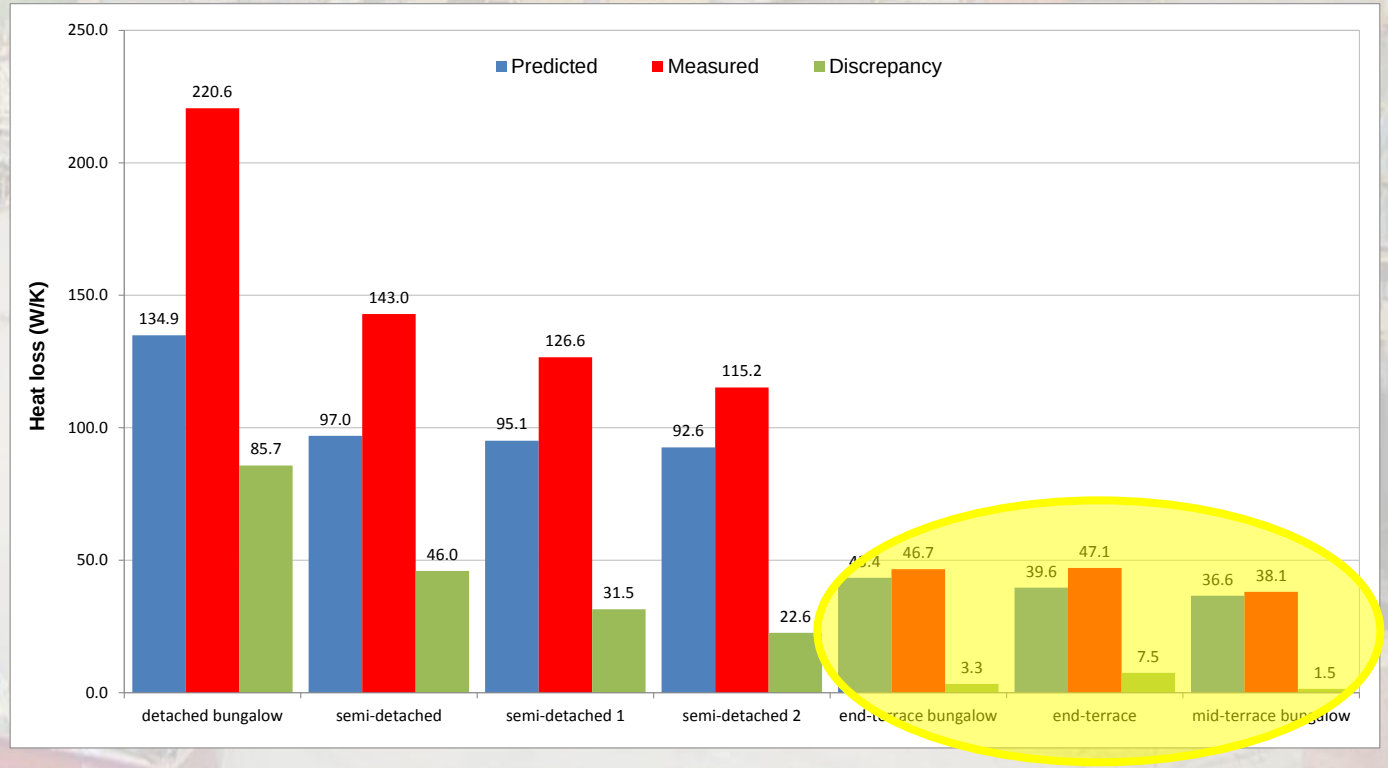
LEEDS METROPOLITAN UNIVERSITY
Leeds Sustainability Institute

CeBE

New build dwellings – some recent results

7 new build dwellings tested as part of the **TSB Building Performance Evaluation Programme**:

- **Care needs to be taken regarding what is meant by the term *'predicted'* HLC – it is not the *'designed'* HLC!**
- ***In this instance, the predicted HLC cannot be greater than the measured HLC!***



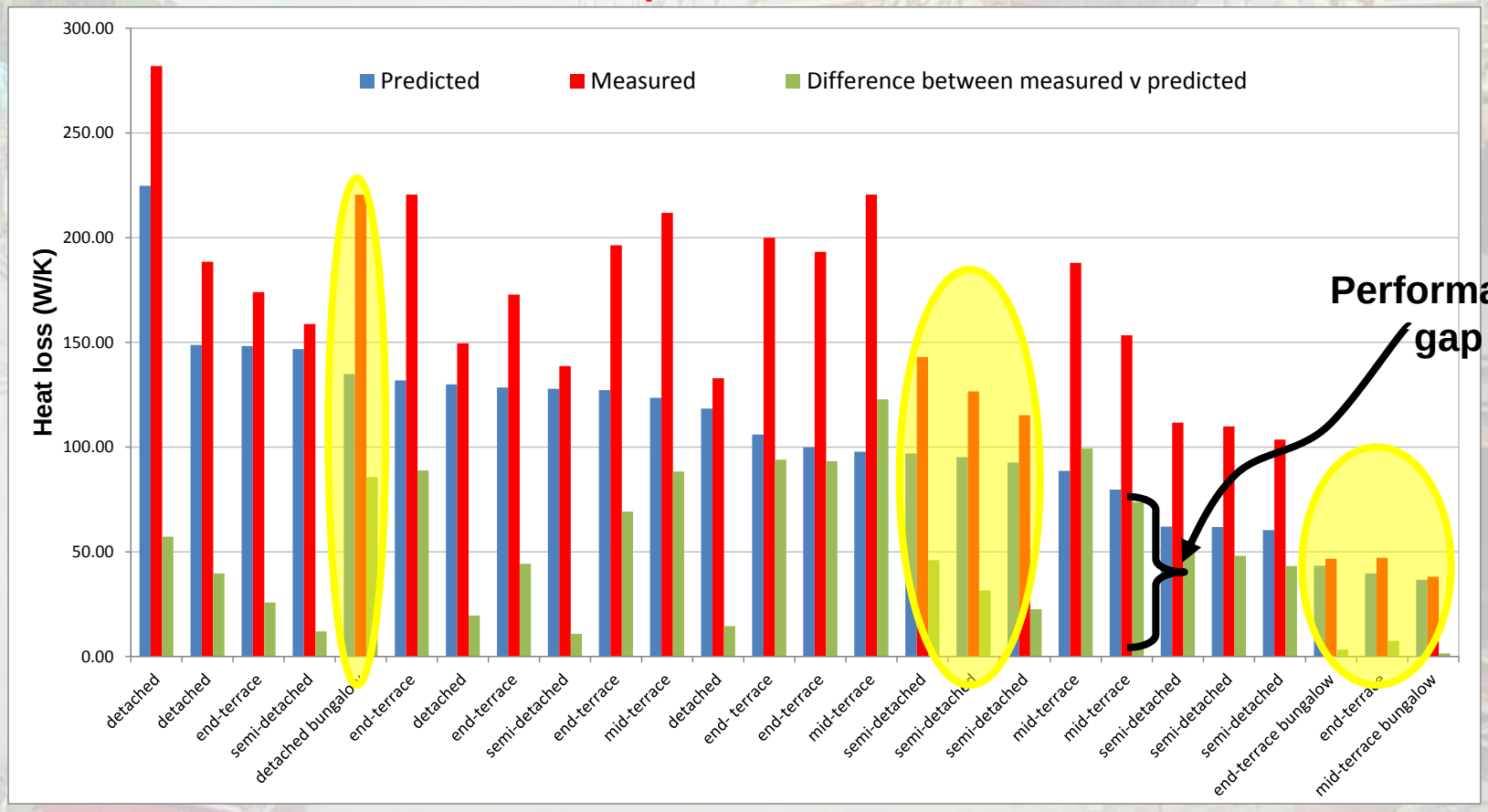
LEEDS METROPOLITAN UNIVERSITY
Leeds Sustainability Institute

CeBE

LeedsMet coheating database – new build dwellings

Database of **26 new build** dwellings:

- **All dwellings built to conform to or exceed Part L 2006.**
- **However, it is a non-random sample.**



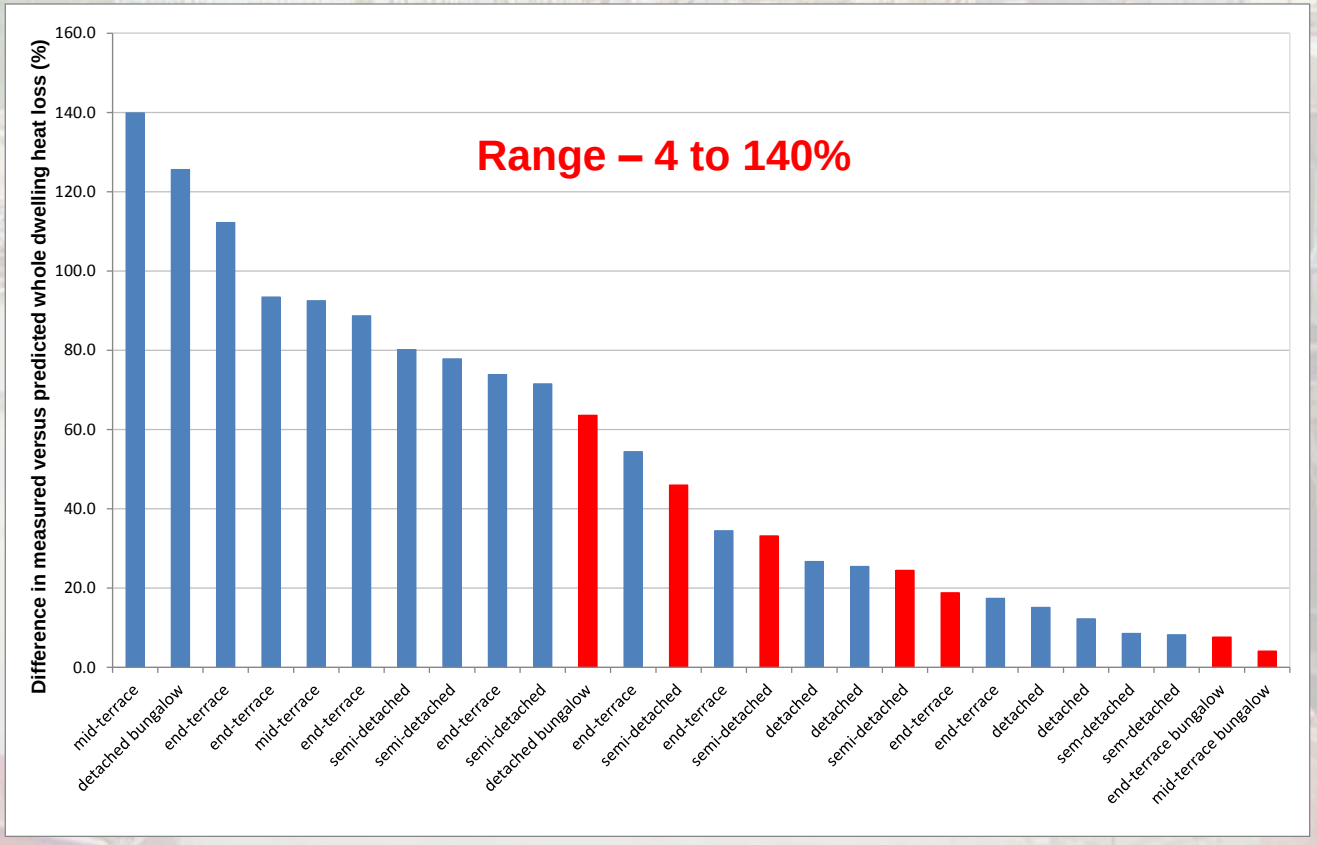
LEEDS METROPOLITAN UNIVERSITY
Leeds Sustainability Institute

CeBE

LeedsMet coheating database – new build dwellings

% difference in **measured v predicted** HLC:

- **Often presented, and very often *misinterpreted!***
- **Can unfairly penalise dwellings with a very low heat loss, such as Passivhaus.**



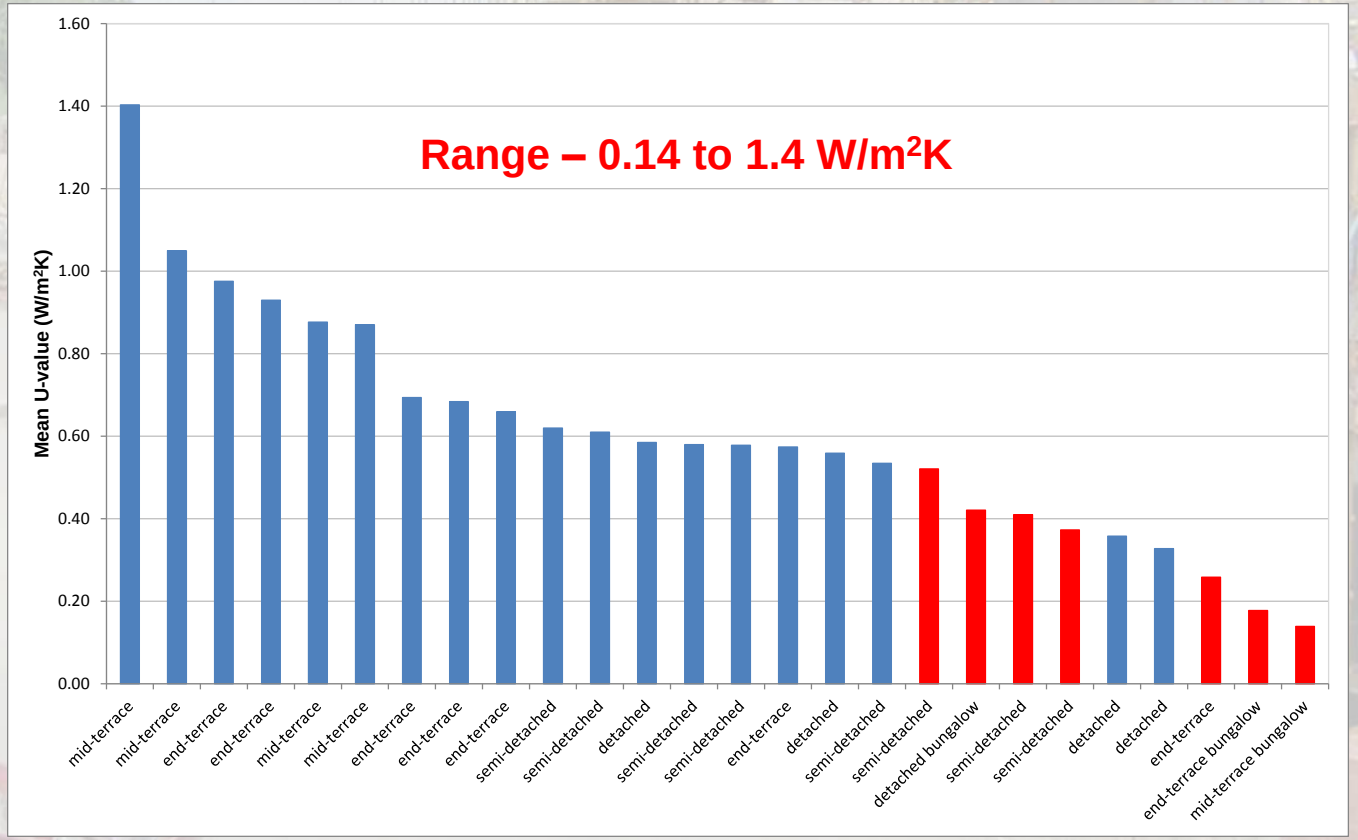
LEEDS METROPOLITAN UNIVERSITY
Leeds Sustainability Institute

CeBE

LeedsMet coheating database – new build dwellings

Whole building **mean U-value** (W/m^{2}K):

- **More appropriate way to compare different dwelling forms.**



LEEDS METROPOLITAN UNIVERSITY
Leeds Sustainability Institute

CeBE

Reliability and repeatability of the coheating test

Tests have been undertaken under **controlled conditions** at the **Salford Energy House**

- **2 Separate tests undertaken:**
  - **Coheating test on virgin dwelling using LeedsMet protocol. 3 different ΔT's used - ~ 10K, ~ 15K and ~ 20K. Results as follows:**

Delta T (K)	Power (W)	HLC (W/K)
10.9	2454.8	224.8
16.2	3605	222.9
20.6	4566.6	222.2
	Mean	**223.3**

  - **Coheating test at various stages of refurbishment to measure the impact of various fabric improvements.**
- **The coheating test results compare favourably with those obtained using an alternative testing technique – QUB.**

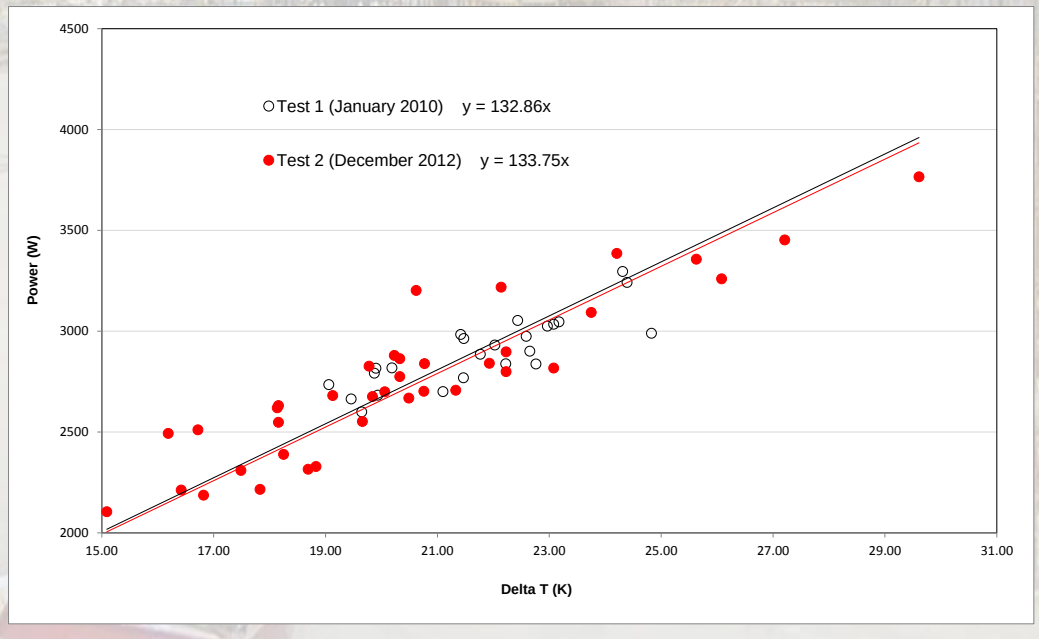
LEEDS METROPOLITAN UNIVERSITY
Leeds Sustainability Institute

CeBE

Reliability and repeatability of the coheating test

Repeat tests undertaken on the **same 2½ storey detached dwelling** almost **3 years** apart revealed the following:

- **Virtually no difference (<1%) in HLC.**
  - **132.9 ± 1.5 W/K January 2010.**
  - **133.8 ± 1.9 W/K December 2013.**
- **Independent T test showed no statistically significant difference (*p* = 0.432) between the HLC's.**



LEEDS METROPOLITAN UNIVERSITY
Leeds Sustainability Institute

CeBE

Alternative testing methodologies

A ***'Simplified'*** **test method** is currently under development at LeedsMet (Farmer, 2013):

- **Minimal equipment required:**
  - **Temperature/humidity sensors.**
  - **Method of measuring space heating power input.**
- **Preliminary tests undertaken on 2 separate dwellings – 1 masonry, 1 timber-frame.**
- **Results are encouraging.**
- **Repeat tests planned for this month.**
- **Can also be used to test the performance of the space heating system.**

LEEDS METROPOLITAN UNIVERSITY
Leeds Sustainability Institute

CeBE

Coheating Test 31-Jan-2014

LEEDS METROPOLITAN UNIVERSITY
Leeds Sustainability Institute

CeBE

Coheating Testing - Interventions

Existing Dwelling

New Build (2006 Regs)

LEEDS METROPOLITAN UNIVERSITY
Leeds Sustainability Institute

CeBE

Coheating Testing - Interventions