DECC Solid Wall Research Project

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Content

- The project outline
- The work packages
- Major Areas of Work
- Summary to Date

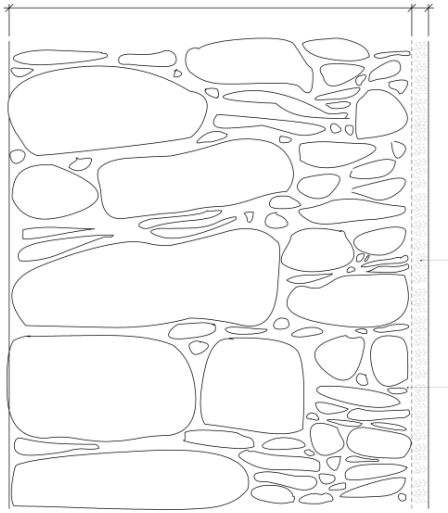
More than just bricks

- The project aims to look at the construction types in the UK of solid wall construction that make up the largest percentage

- More than just brick properties, with overlap into other construction forms, particularly in thermal performance and risk.

Work Package 1 - Literature review and data assessment

- what's already known
- heritage considerations
- understanding heat loss measurement
- un- intended consequences
- human behaviour
- solid wall performance actual v predicted

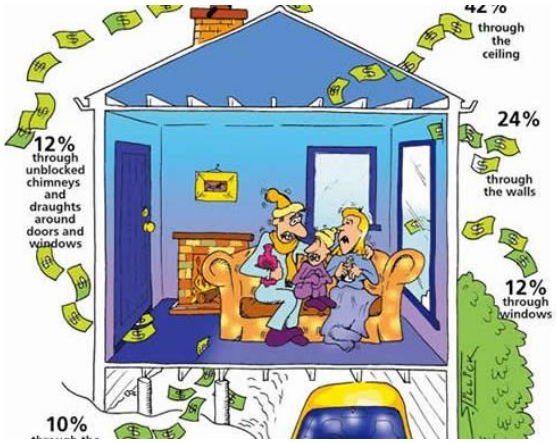


Work Package 2 - Understanding heat losses from solid walls

- Moisture content
- Micro cavities
- Continuity of mortar
- Unknown properties of materials within structures
- Thermal conductivity of different materials
- Effects of Exposure and Rh on u-values
- Hot boxing and in situ measurement of a range of configurations

Work Package 3 - Pre- and post- insulation survey: The performance gap

- What effect does the installation of solid wall insulation have on energy use behaviour in different types of dwellings?
- What are the typical energy savings that can be expected following the installation of solid wall insulation?
- What effect does it have on internal temperatures across the year? Is there evidence of overheating?

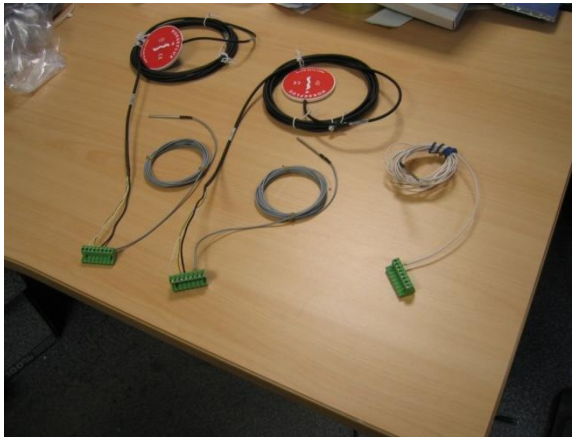


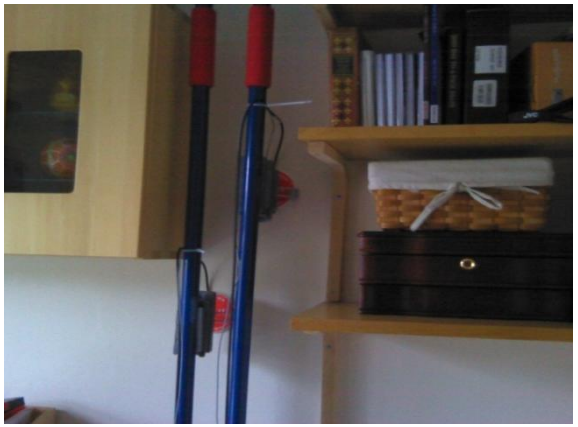
WP 3 – Cont'd

- What effect (if any) does it have on condensation levels and mould growth?
- Are there any other effects on other indicators of air quality?
- Is there any evidence of other un-intended consequences of refurbishment (for example on the structural integrity of the building caused by damp problems)? Covered in depth WP5

Work package 4 - Methodologies for measuring & calculating U-values

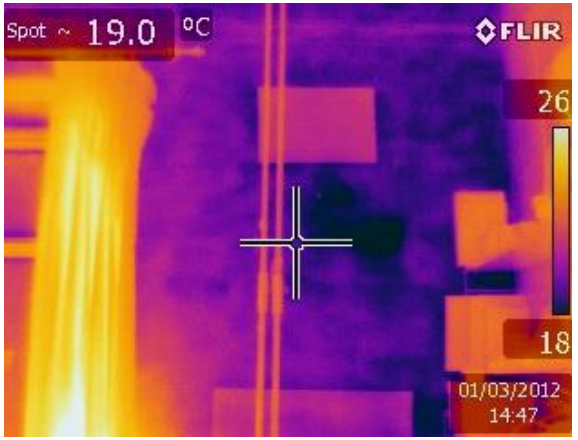
- This task will provide verification and validation of the methodology used to measure heat flux of walls *in-situ*. It consists of a number of laboratory and test-house experiments, and a summary validation report on the results of these tests including recommendations for any changes to the methodology.
- A range of testing and calibration of methods

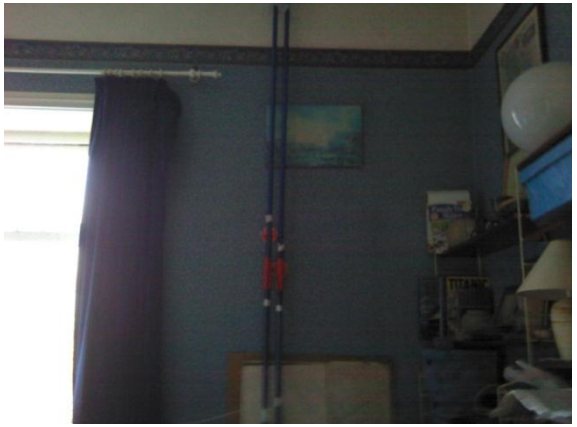




WP 4 Cont'd

- Tests 1a to 1e: Hot-box tests on heat flux plates
- Test 2: Reproducibility of measured U-value at a single measurement point
- Test 3: Testing the method of pressure-fixing
- Test 4: Determining the effect of sunlight:
- Test 5: Determining the effect of surface texture:
- Test 6: Effect of vertical temperature stratification on measured U-value:
- Test 7: Investigation into the effect of heat flux plate calibration and construction:





WP 5

– A process for surveying and understanding the risks of un-intended consequences.
  - Systemic
  - Design
  - Human Behaviour
  - Environmental Conditions
  - Building Physics

WP 6

– A method of measuring a u-value of a building in situ.

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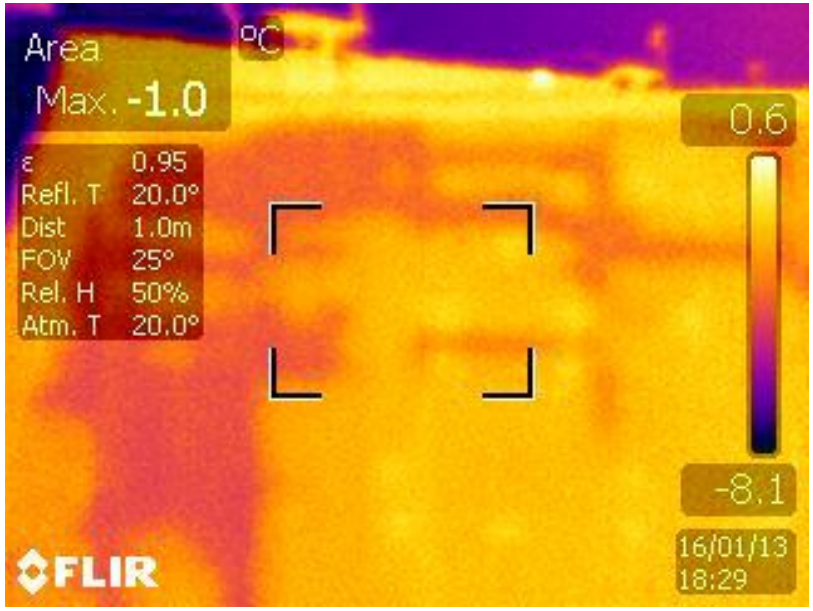
WP 5 -Revisiting previous work

- Previous experience of the effect of inappropriate insulation.
- Previous experience of poorly assessed buildings being chosen for insulation
- Poor detailing on site – even if appropriate
- Understanding of the risk of insulating older properties, with many unknown factors being assumed.
- Understanding the effect of wind driven rain on buildings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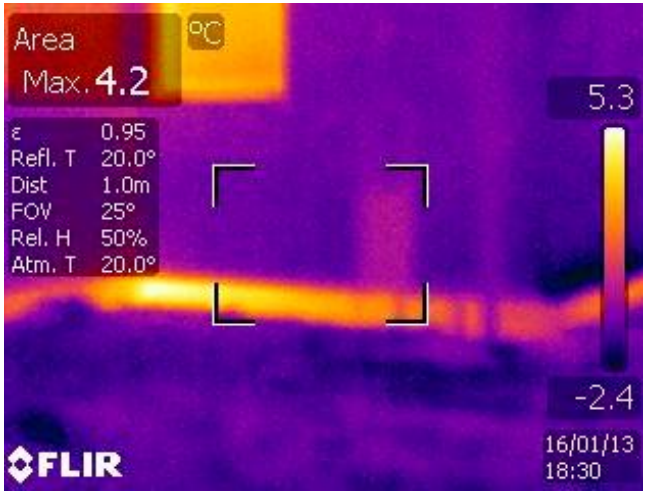
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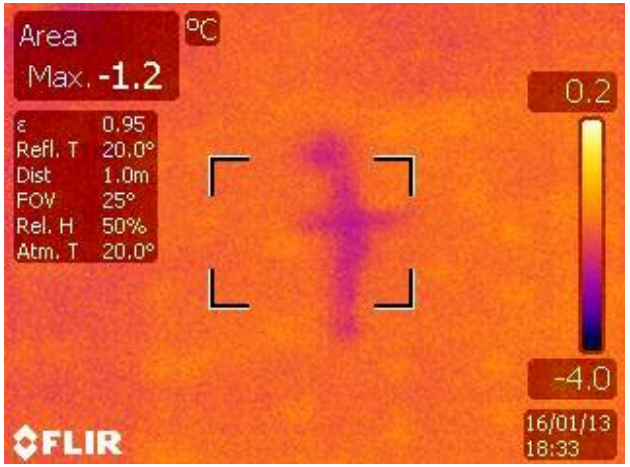
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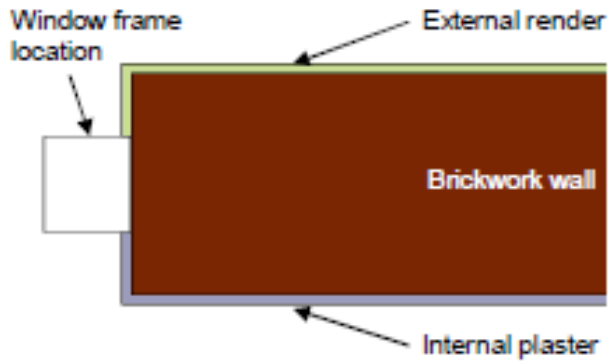
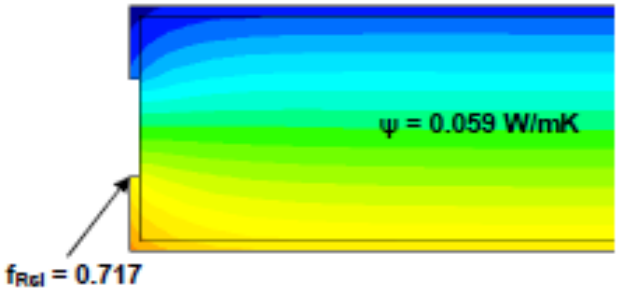
Thermal Bridging Modelling

- Standard Industry approach to detailing openings
- Difficult to insulate ? so rarely done.
- Impact of in-correct detailing

Figure 1a: Baseline jamb detail

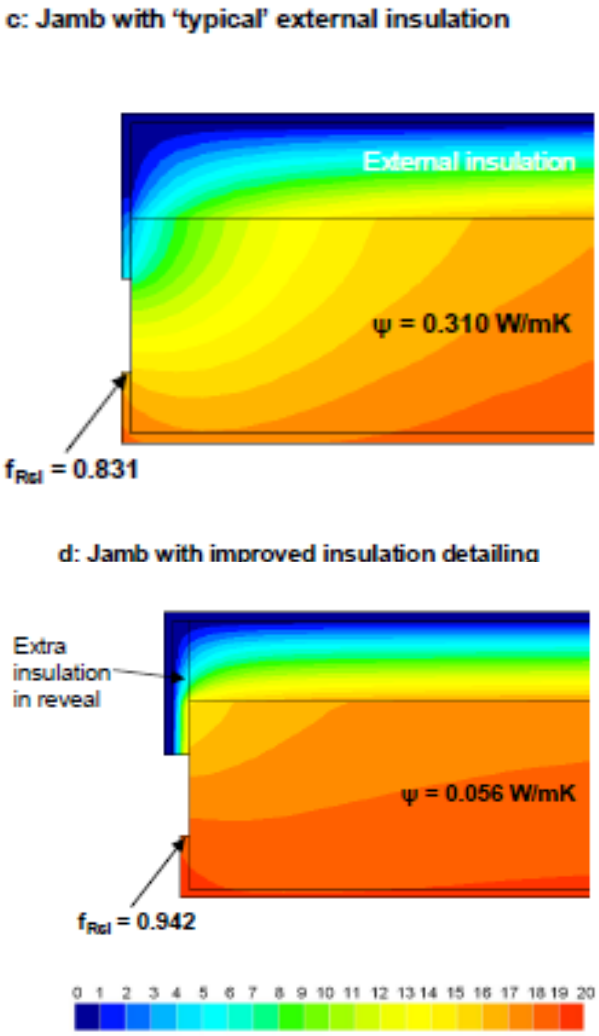


b: Baseline jamb with temperature gradations



Thermal Bridging

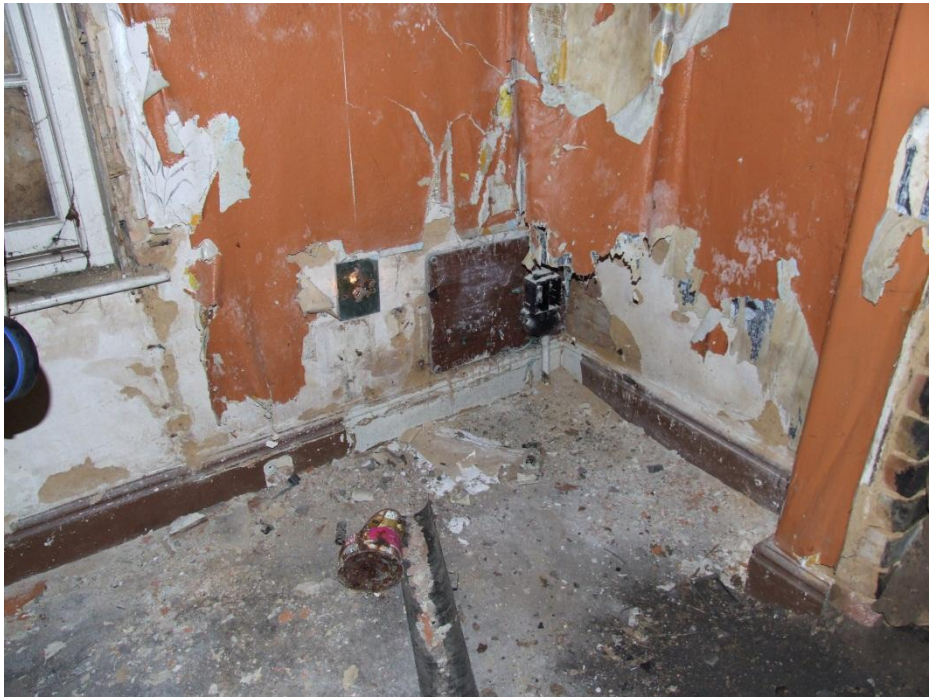
- Initial modelling indicates if the reveals and heads etc are not insulated the psi value of the area becomes worse than before insulated.
- Risk shifted to areas least capable of dealing with them.
- Increased heat loss, and much higher risk of condensation and mould growth / failure.



Categorisation of Issues

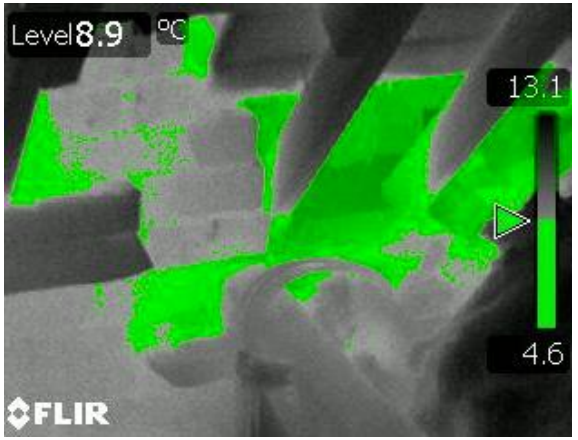
- Assessment and survey stage
- Testing of materials
- Systematic errors
- Process
- Workmanship

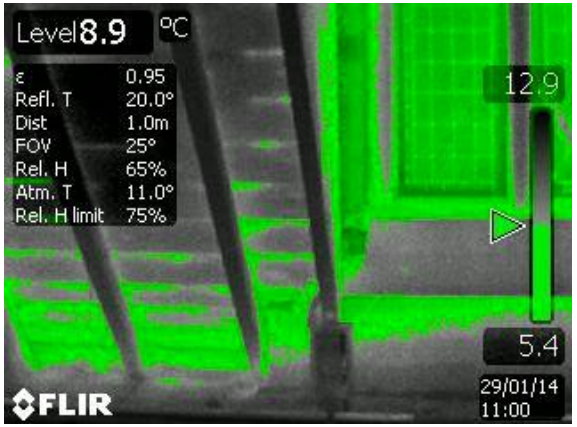
- Looking at cause and effect, guidance on understanding and quantifying risk and reducing it



Findings to Date

- Moisture affects the thermal capacity of any building element, significant if excessive.
- Many wall constructions measured, if dry all significantly better than when calculated using BR443 for a number of reasons.
- On average approximately 30% better
- 86% of the differences now quantified





Unintended Consequences

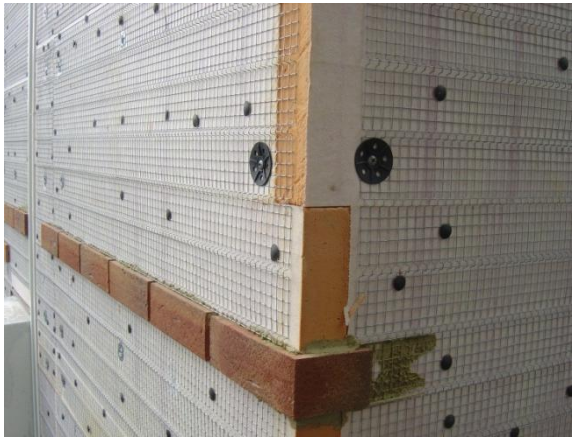
- Currently standing at 76
- A range of categories, including
  - Comfort payback by residents
  - Increase in condensation and mould
  - Increase in dustmite and bedbug populations
  - Premature decay in timbers
  - Reduced performance due to poor construction details
  - Lack of correct skills to assess wall construction
  - Qualification for EWI pitched too low

Systematic / Workmanship

- Weakness in the system , over reliance on sealant between 18 and 36 tubes per property.
- Insufficient checking of key stages
- Poor installation, poor standard industry details that create cold bridges
- Lack of understanding on correct application

Next Steps

- Dedicated web page of BRE site with reports and findings
- Review of skills, standards, condensation risk assessment, training for assessors
- In use factors for EWI firmed up
- Guidance on designing out unintended consequences



Thank you for Listening