

# Scaling up retrofit

Dr Sarah Price



1. Background – Retrofit challenge
  2. Whole house retrofit
  3. TCosy™
  4. TCosy2
- Questions

## UK Parliament declares climate change emergency

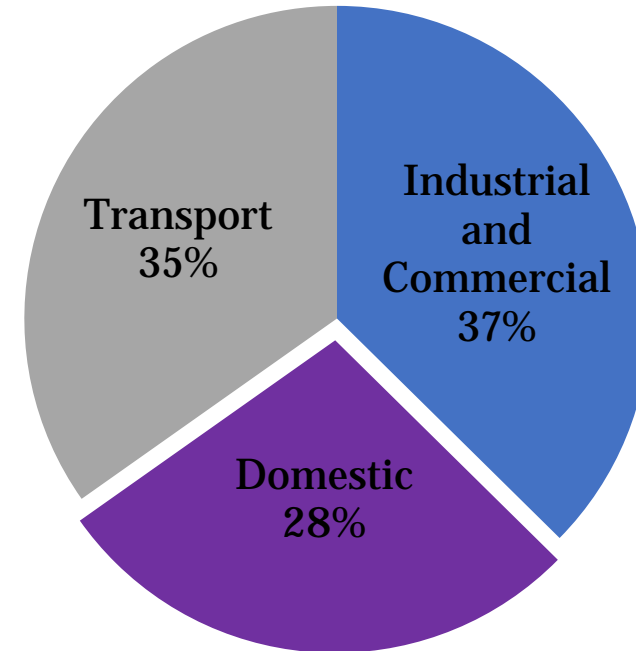
1 May 2019

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MPs have approved a motion to declare an environment and climate emergency.

## UK total carbon emissions 2017



CCC Report May 2019

“Energy efficiency retrofit of the 29 million existing homes across the UK should now be a national infrastructure priority.”

# What we do now...





**..and this is what we get**

**A bad retrofit can be worse than doing nothing**



# What we need to do...

50-60% carbon reductions

- Wall insulation
- Floor insulation
- Roof insulation
- New low-energy windows
- Airtight homes
- No cold spots
- Ventilation – with or without heat recovery
- Non-gas heating system
- Renewables

And at a rate of one home every minute for the next 30 years

## UK's housing stock 'needs massive retrofit to meet climate targets'

**Hundreds of millions of pounds must be spent to achieve 80% cuts in greenhouse gas emissions by 2050, report shows**

**Fiona Harvey** *Environment correspondent*

Thu 11 Oct 2018 07:01 BST



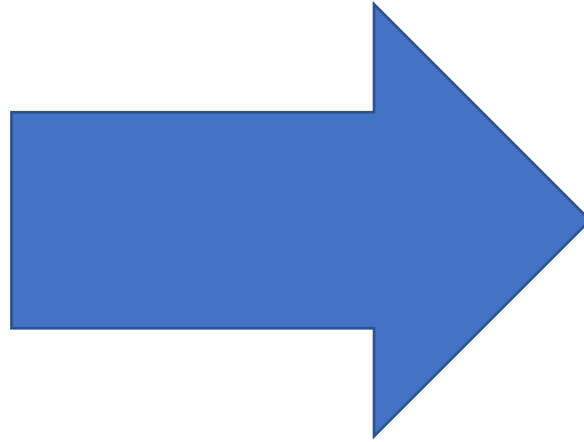
108



▲ Low-carbon 'Energiesprong' homes in Nottingham. Photograph: Energiesprong International/IET

Hundreds of millions of pounds must be spent on the UK's draughty housing stock to meet the government's [climate change targets](#), with progress so far too slow to make the difference needed.

How to we do it?



£ £ £

???

“Offsite ground  
approach  
retrofit”

**TCosy**



“Holistic cost-efficient  
cladding with  
integrated mechanical  
ventilation”

**TCosy2**



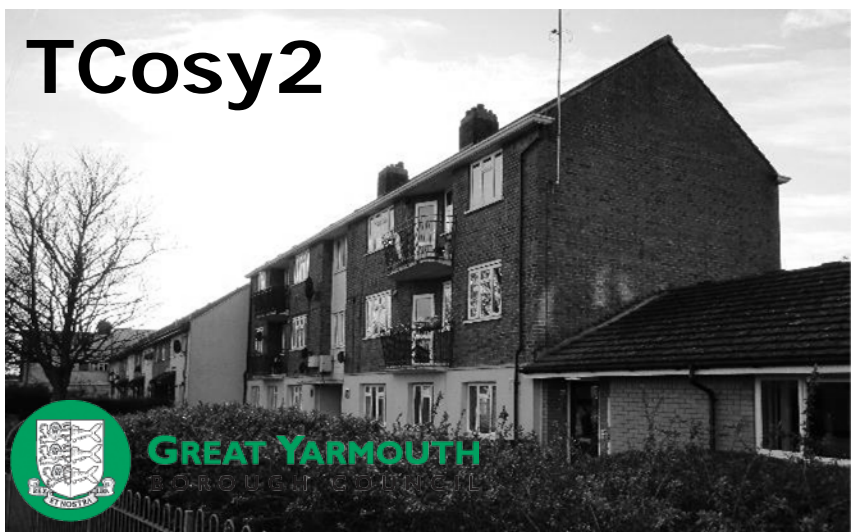




Start: Oct 2013  
End: July 2016



Innovate UK



Start: Oct 2018  
End: Feb 2021



Department for  
Business, Energy  
& Industrial Strategy



Enhabit™ OXFORD  
BROOKES  
UNIVERSITY

the design buro<sup>db</sup>

# TCosy™ elements

## Roof and walls

- Air tight membrane
- Highly insulated walls and roofs
- Continuous insulation
- Thermal bridges minimised

## Windows

- Fitted into insulation layer
- Triple glazed, air tight

## Ventilation

- Mechanical ventilation with heat recovery
- Integral to the TCosy system



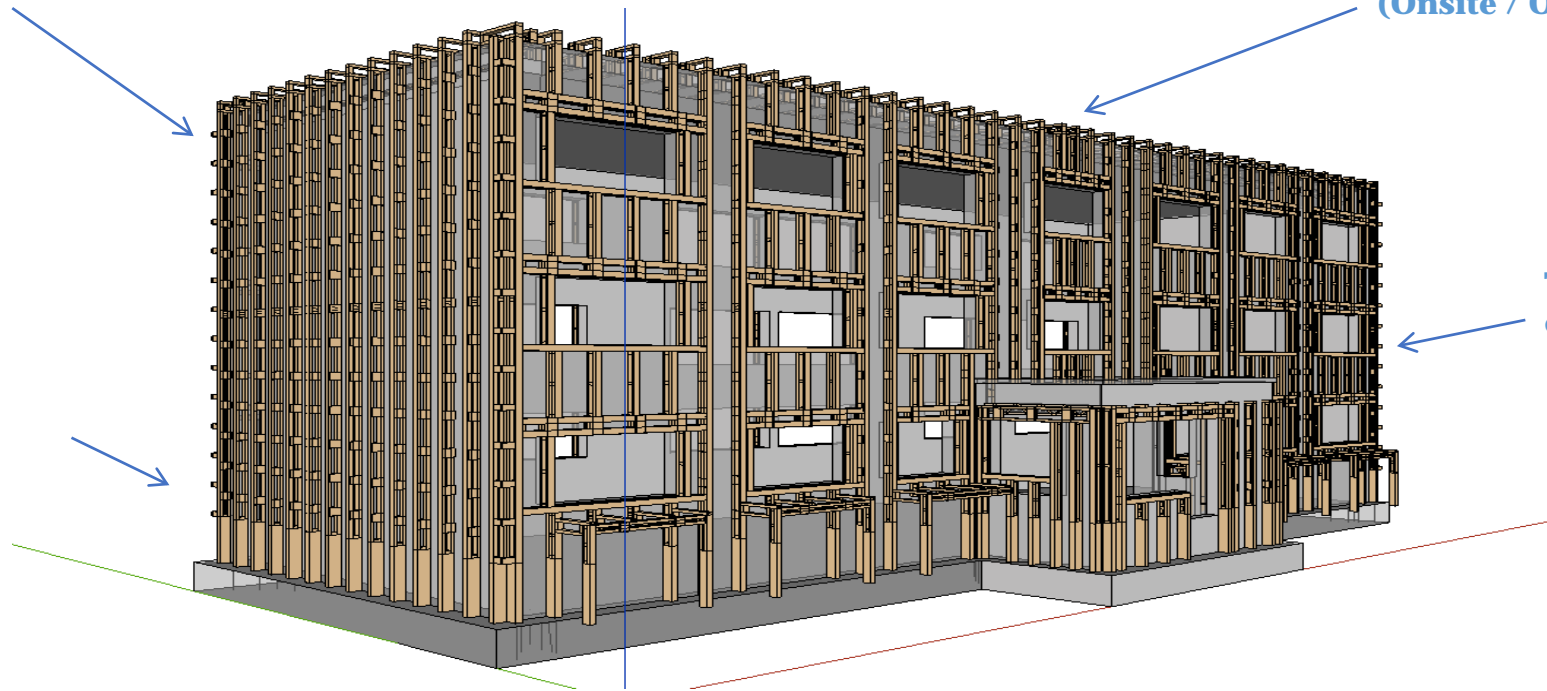
## Quick simple manufacture and erection of Beattie Passive TCosy™

- U-value: Walls -  $0.11\text{w/m}^2\text{k}$ , Roof -  $0.13\text{w/m}^2\text{k}$

**MVHR (Mechanical Ventilation and Heat Recovery System)**

**Photovoltaics (Onsite / Offsite)**

**Triple glazed, passive certified windows**



**Beattie**  
**PASSIVE**

UK's First Certified Passivhaus Build System



**Engage occupants in project.  
Retrofit causes limited disturbance**

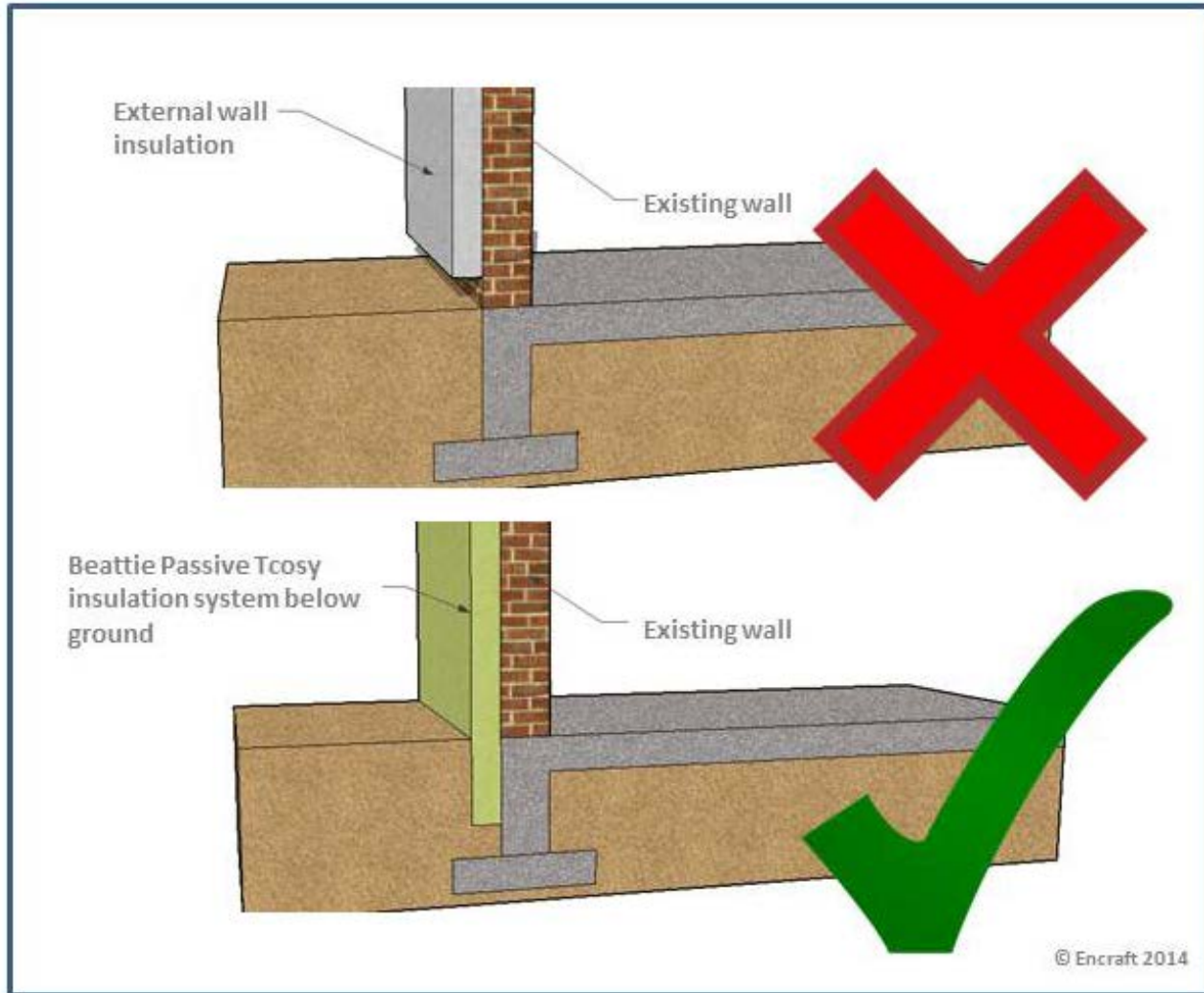


**Beattie Passive Testing and Certification ensure delivered as designed: Structural, thermal and air testing**



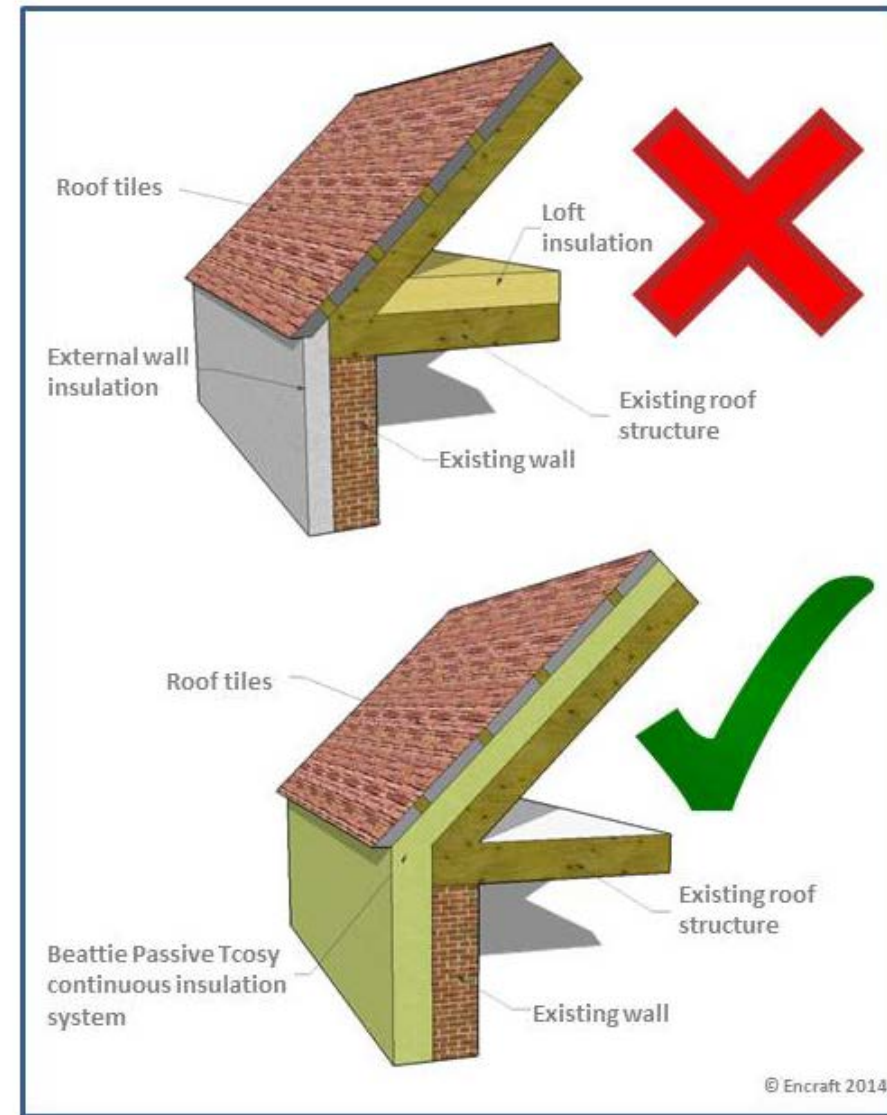
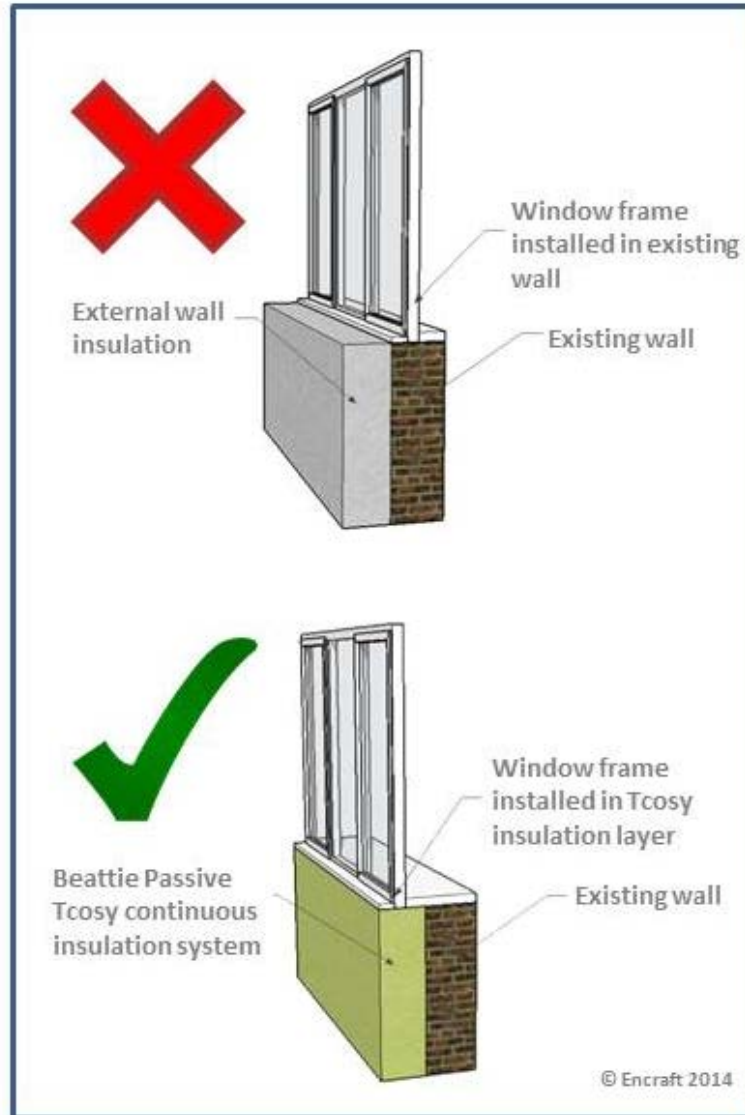


# Thermal bridges minimised

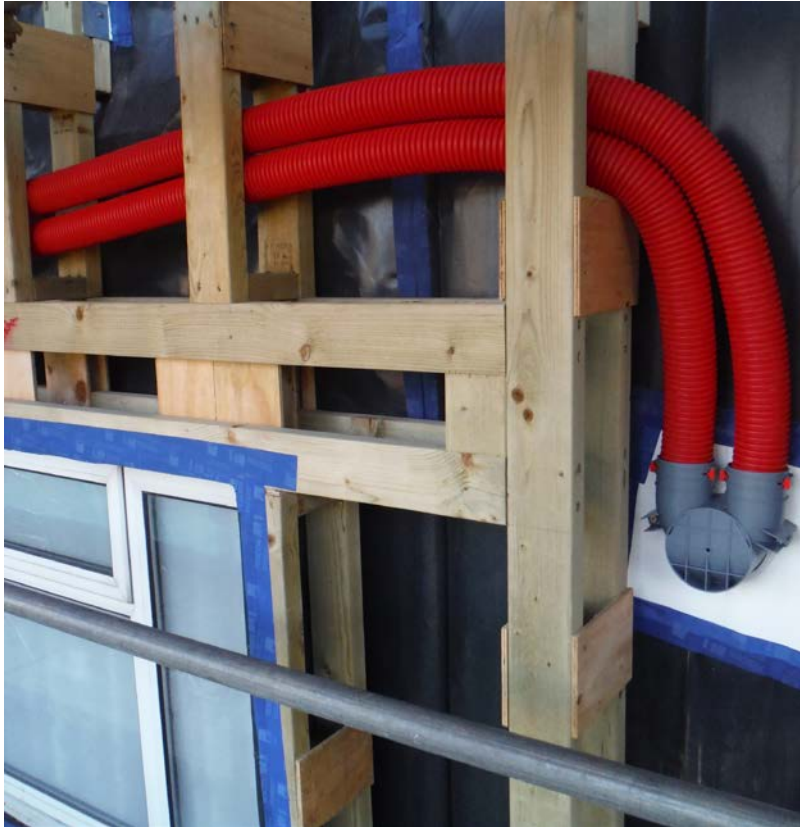




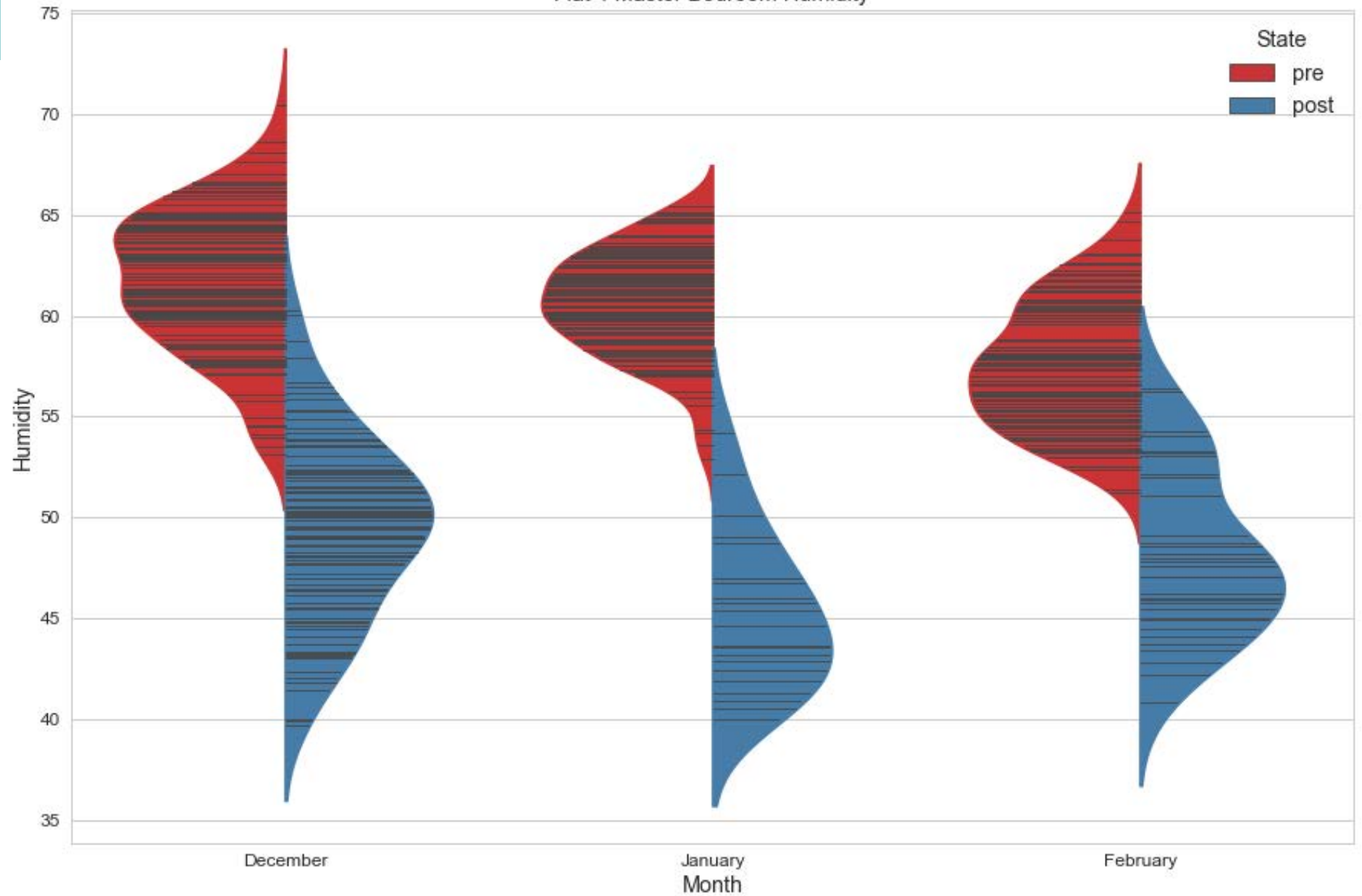
# Thermal bridges minimised



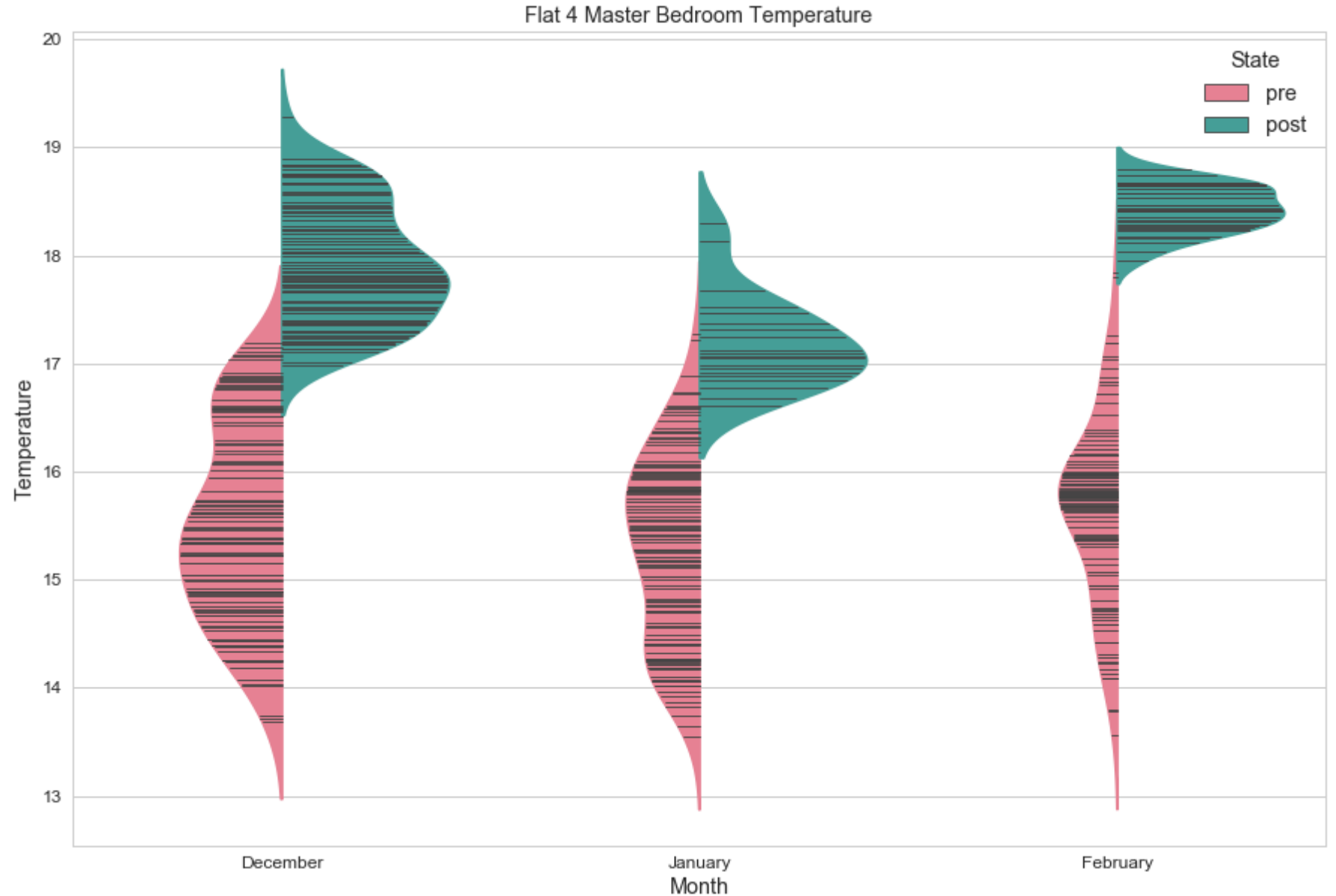
# Mechanical ventilation with heat recovery



Flat 4 Master Bedroom Humidity



**Predicted:**  
**79% energy savings**  
**£1000 energy bill savings per flat**  
**70% CO<sub>2</sub> savings**







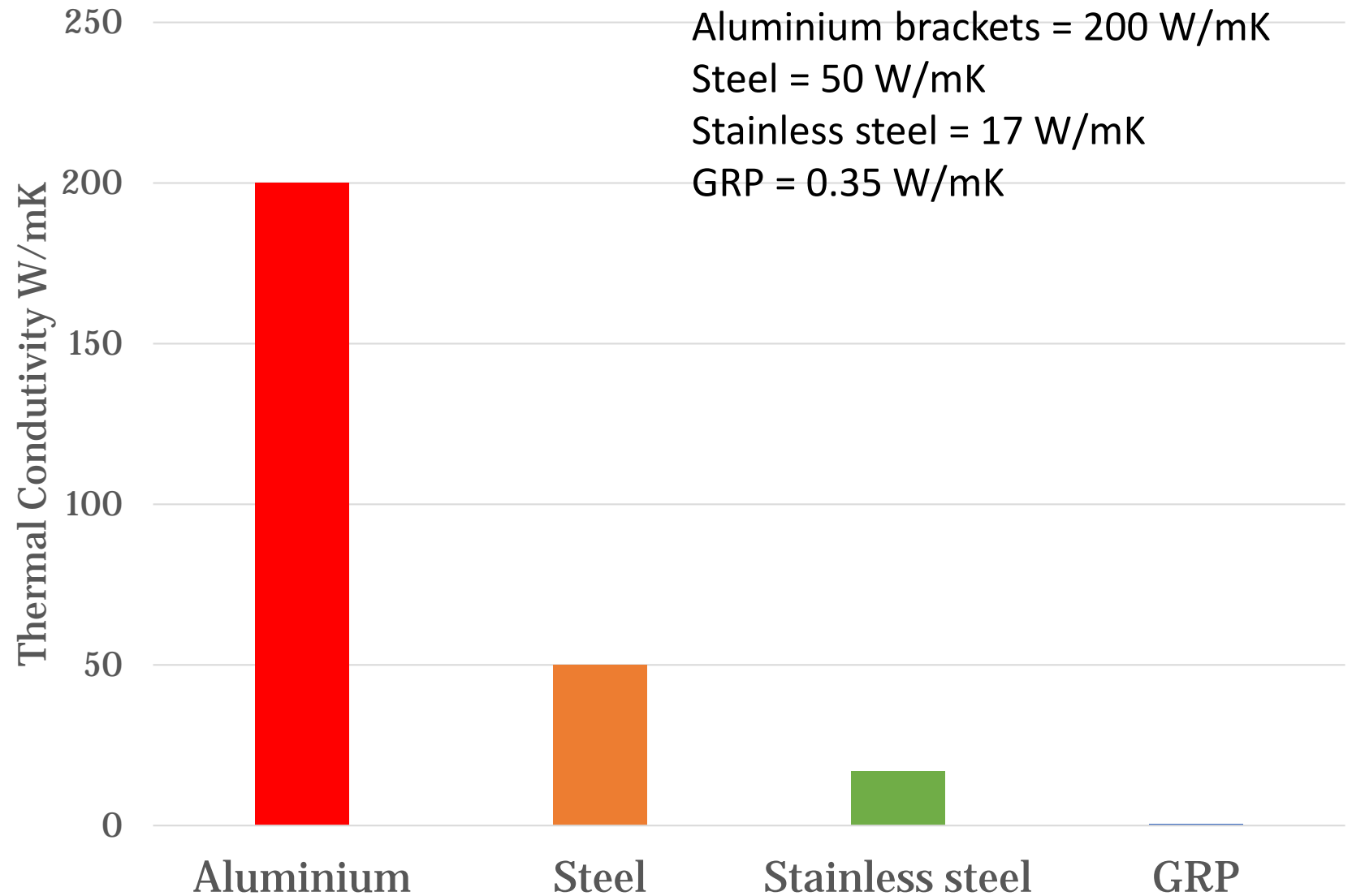
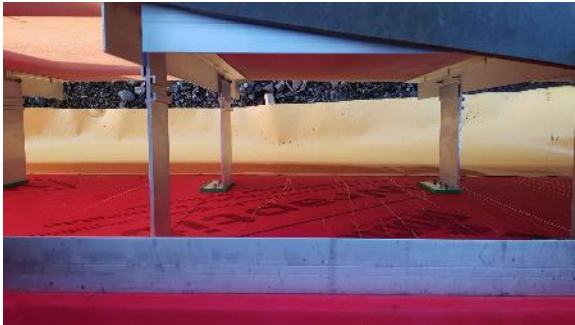
## Second generation of TCosy™

Cladding system – no timber

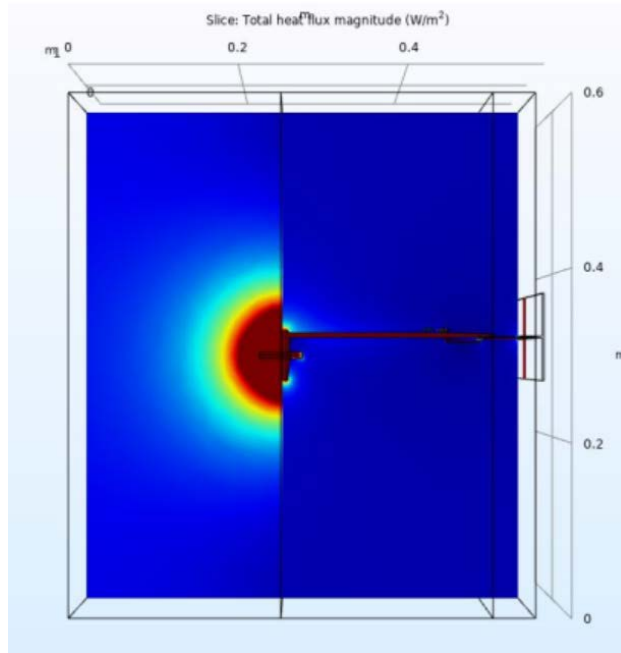
Testing

- Cladding fixings
- New airtightness products
- Fire testing
- Water testing

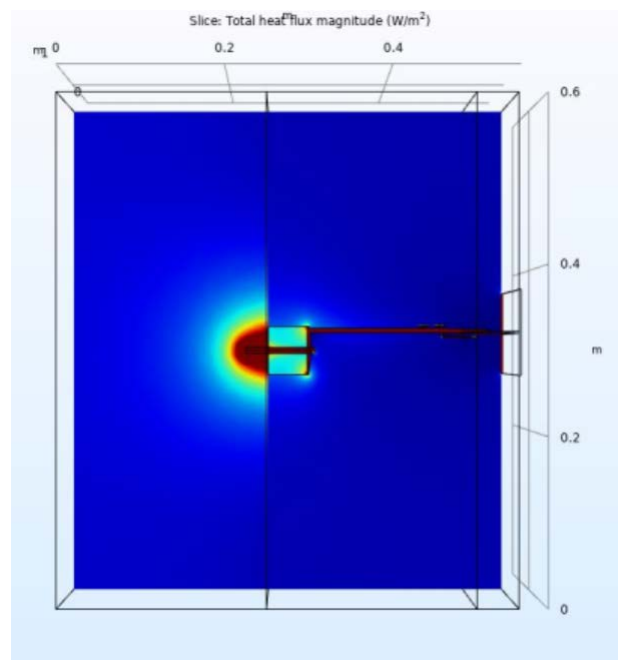
# Thermal bridges from fixings...



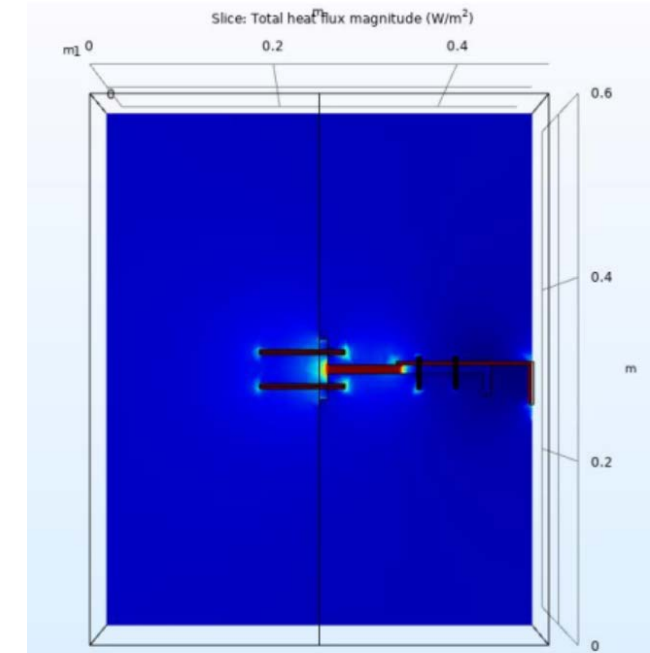
# Cladding fixings can lose a lot of heat



150mm aluminium fixing with 5mm plastic thermal break  
 $0.11 \Delta U$  (W/m<sup>2</sup>K)



150mm aluminium fixing with 50mm foam glass thermal break  
 $0.05 \Delta U$  (W/m<sup>2</sup>K)



138mm pultruded GRP fixing, no thermal break  
 $0.01 \Delta U$  (W/m<sup>2</sup>K)



# Air tightness testing



$0.35\text{m}^3/\text{hm}^2$  (@50pa)



# Fire and water testing





Start onsite:  
July 2019



Completion:  
Sept 2019



Thank you...

QUESTIONS?

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