



Crossway Performance Monitoring

Richard Jack

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Built in 2009 and featuring on Grand Designs, Crossway was one of the first Passivhaus certified buildings in the UK. Admired for its innovation as well as its beautiful hand-made parabolic arch, the highly-acclaimed project proves that clever architecture need not be expensive. Crossway was built by Richard and Sophie Hawkes and since its construction has served as a family home and has been used to test out the latest eco-technology. Richard and Sophie have continued to build unique, energy conscious homes through their practice, Hawkes Architecture.



Twelve years after its construction, the thermal performance of Crossway was measured using SmartHTC, an innovative measurement method developed by Build Test Solutions. SmartHTC is based on temperature and energy monitoring carried out over at least three weeks while the house is occupied as normal. The thermal performance is calculated using a simple online interface.

Richard completed the measurement himself, with a keen awareness of the importance of delivering as-built as well as as-designed energy performance, using the measurement as a trial of the practicality of carrying out further measurements in other Hawkes Architecture projects.

The SmartHTC measurement showed that Crossway has excellent thermal performance. This is measured by the 'Heat Transfer Coefficient', which is a measure of the rate of heat loss for each degree of temperature difference between inside and out. To allow comparison between buildings the Heat Transfer Coefficient is divided by the floor area of the house, termed the 'Heat Loss Parameter'. A lower number reflects less heat loss and hence less heat required to keep the building warm.

Thermal Performance

HEAT TRANSFER COEFFICIENT (HTC) ⓘ

240 W/K

HEAT LOSS PARAMETER (HLP) ⓘ

0.9 W/m²K

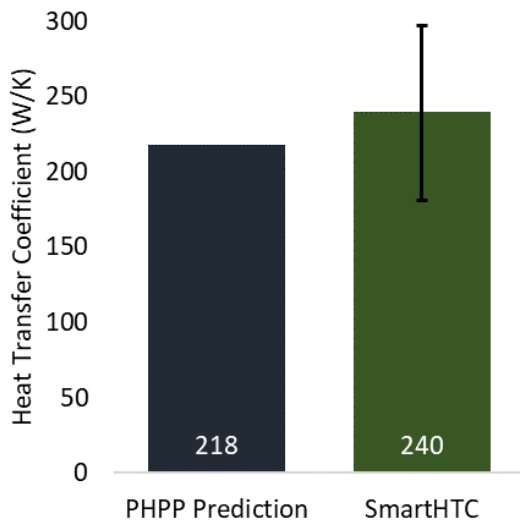
HLP RATING

Excellent

CONFIDENCE INTERVAL ⓘ

[-59, +57] W/K

Heat Loss Parameter Scale (HTC normalised by the floor area)		HLP (W/m ² K)
0-1	Excellent	0.9
1-2	Good	
2-3	Average	
3+	Poor	

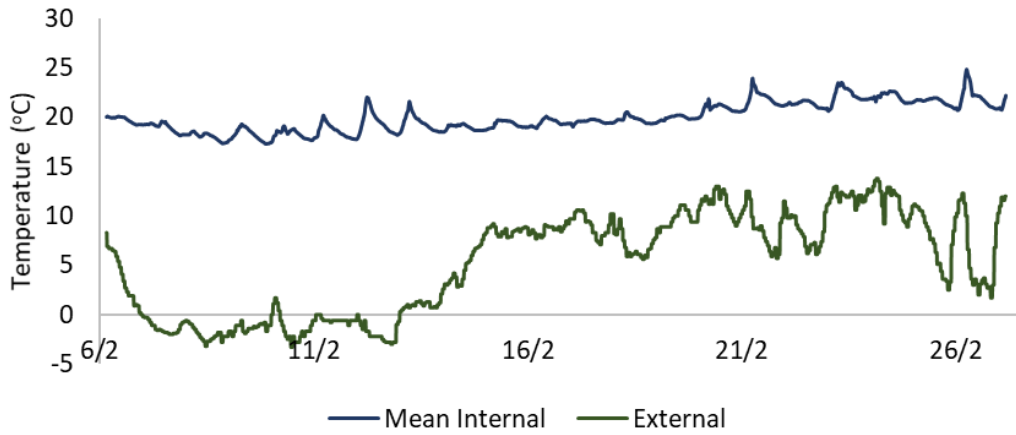


The SmartHTC results demonstrate that the energy efficient ambitions of the Passivhaus design are still being realised twelve years after construction. The measured performance is similar to the predicted performance at design stage by the Passivhaus Planning Package (PHPP), with the prediction within the confidence interval of the measurement.

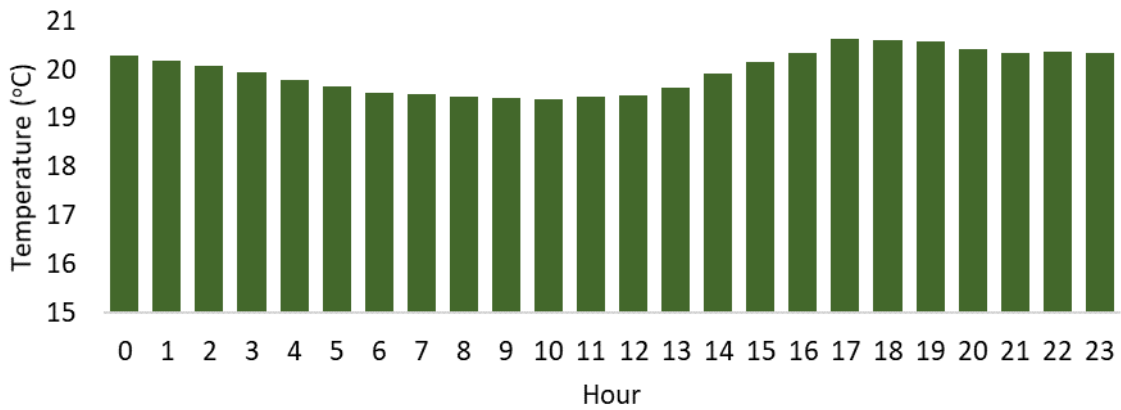
Buildings often have worse than expected thermal performance, the so called 'performance gap', so demonstrating as-expected performance is another validation of the design, construction and operation of this unique house. Richard Hawkes reflected on the SmartHTC results:

"It's reassuring to see the data. We've always known that the house is comfortable and cheap to run but it's still good to see it in numbers. After living in the house for 12 years and bringing up a young family we've sort of got used to how well the house works so haven't been so focussed on "being efficient" in recent years. We know from all this time living in the house that bills are negligible so we feel we can just enjoy the house in the comfort of knowing that it doesn't use much energy."

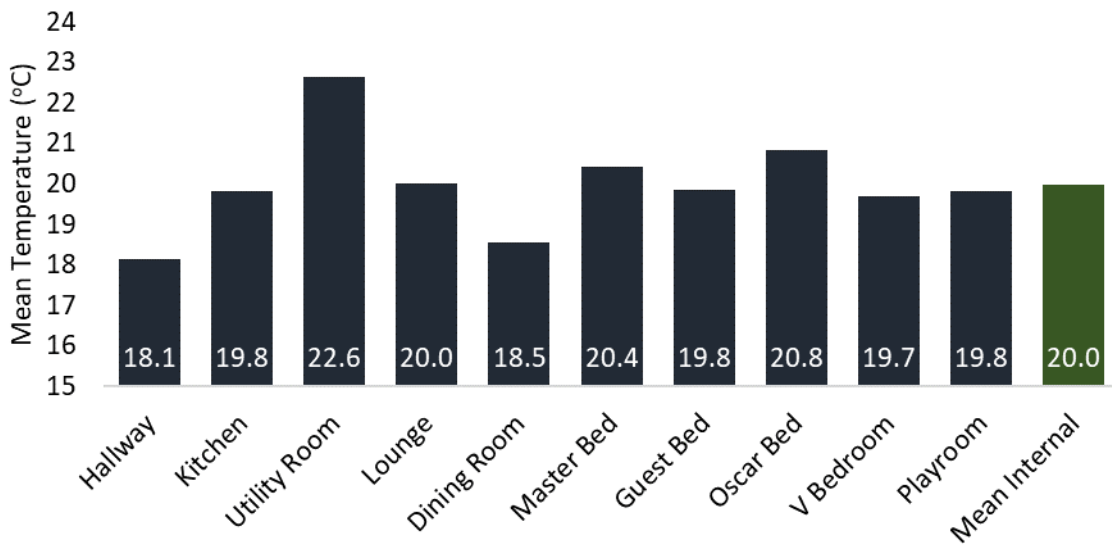
The temperature inside the house was comfortable throughout the measurement period, varying between a minimum of 17°C and a maximum of 25°C with an average of 20°C through a period of cool weather in the week of the monitoring.



The temperature was pretty consistent throughout the day during the monitoring, but slightly warmer overnight.



There was some variation between the temperature in the different room, with the hallway having the lowest and the utility room having the highest temperature.



The temperature monitoring was carried out using discrete sensors placed around the house, the sensors can be placed in discrete locations so that they don't interrupt the normal use of the house. Energy monitoring was carried out by simple manual readings of the service and PV generation meters taken at the start and end of the temperature monitoring.

"After we distributed the temperature sensors on shelves around the house we just forgot they were there. I just set a diary reminder to pick them up 3 weeks later. It really couldn't have been easier." - Richard Hawkes



The calculation is carried out in a browser interface, which allows data entry about the building through simple forms and drag and drop upload of the temperature sensor files. The performance measurement results are returned through the same interface.

A screenshot of the SmartHTC 'Edit Building' web interface. The page has a navigation bar with 'Buildings', 'Tools', and 'Help' menus, and a 'Profile' and 'Logout' button. The main content area is titled 'Edit Building' and shows a progress bar with three steps: 'Building Information', 'Measurement Data', and 'Calculation Result'. The 'Building Information' step is active. Below the progress bar is a 'Building Details' form with a 'REQUIRED' label. The form contains fields for 'My Reference' (000 Crossway), 'Postcode' (TN12 0JA), 'Latitude' (0.00), 'Longitude' (0.00), and 'Floor Area' (270.0 m²).

Thinking ahead to integrating performance measurement into the practice's work Richard said:

"SmartHTC is just what we've needed for over a decade. It's super easy to use, the results are clear and understandable and there's lots of clever number crunching going on behind the scenes to deliver some robust results which we can rely on to inform our design decisions moving forward. Looking forward to this winter when we can measure & test more of our finished homes."

Contact

enquiries@buildtestsolutions.com
www.buildtestsolutions.com



Build Test Solutions Ltd, 16 St John's Business Park, Lutterworth,
Leicestershire, LE17 4HB

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Company Registration No (England) 09910663