Improving the survey and design process: MEASURED, Build Test Solutions

Project lead:

Build Test Solutions

Partners:

Veritherm UK, Elmhurst Energy Services Ltd

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£233,888

What were the objectives of the project?

The MEASURED project aimed to demonstrate the value of in-situ building performance measurement in improving heat pump surveys and design.

Specifically, the project aimed to:

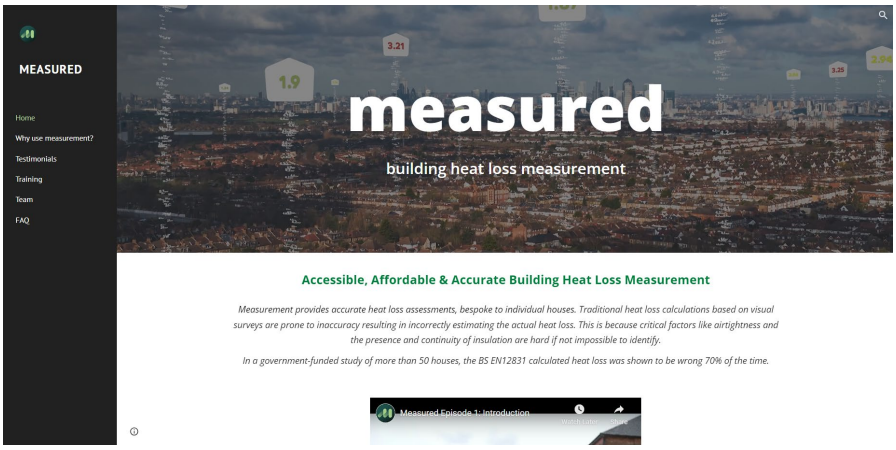
1. Demonstrate that the accuracy of heat loss calculations can be improved by incorporating measured heat loss data.
2. Incorporate measured heat loss data into existing building survey tools.
3. Promote greater understanding and acceptance of measured data in the heat pump sector, including developing a standardised approach to heat loss measurements.

What activities were funded?

- A field trial on over 50 houses to compare heat pump sizing using measured building performance vs traditional survey and calculation methods.
- The development of new software to create a heat loss calculation tool that incorporates building performance measurement, suitable for use by existing Domestic Energy Assessors (DEAs).
- The creation of standardised heat loss measurement protocols to ensure consistent results across different thermal performance measurement methods and providers.

What did the project achieve?

The MEASURED project found that standard, survey-based methods of heat loss calculations are accurate in only 30% of cases compared to the measured heat loss for the same properties. This suggests that measured heat loss data can significantly improve the accuracy of heat pump sizing, which is a critical factor for efficient heat pump performance, potentially reducing capital costs, disruption during installation, and the risk of undersizing. Working with partners, Veritherm and Elmhurst Energy, BTS successfully developed a tool that integrates measured heat loss into Domestic Energy Assessor (DEA) survey tools. In addition, a common calculation methodology was developed for incorporating measured heat loss into heat loss calculations, and a CIBSE working group has been established to explore how BS EN 12831 can be updated to incorporate measured heat loss into room-by-room heat loss assessments.



Project objective 1: Demonstrate that the accuracy of heat loss calculations can be improved by incorporating measured heat loss data

Why is this important?

Industry-standard tools for calculating heat loss are based on a visual survey of the property and an established methodology (BS-EN 12831) for calculating heat loss according to typical U-values and air permeability for different building elements and materials. As such, this method relies on the capability and experience of assessors to identify different construction characteristics from a non-invasive survey and assumes that the heat loss of, for example, brick walls is uniform across different houses (which is not the case). This approach also requires assumptions to be made for critical factors such as levels of air infiltration. This can lead to high uncertainty in the generated heat loss figures and inconsistency between the calculated heat loss values from different assessors. In turn, over or under-estimating heat loss is a critical factor that leads to poor performance and low efficiency of heat pumps and potential increases in the up-front and running costs of the system.

What activities were funded?

A field trial compared measured heat loss with a standard survey and calculation methodology across 56 properties. This trial enabled a direct comparison of a controlled sample to understand the variance (if any) between the two methodologies. The field trial contained a mixture of building archetypes so that the two methodologies could be compared in a sample of different house types and give confidence to the suitability of the methods across the varied UK housing stock.

What were the project findings, and did the project achieve this objective?

The project demonstrated that the accuracy of heat loss calculations can be significantly improved by incorporating measured heat loss data. Across the 56 houses, survey-based heat loss calculations were only found to be accurate relative to the measured data for around 30% of homes. The study found that survey-based methods overestimated heat losses in 59% of cases and underestimated the heat loss in 11% of homes tested.

Project objective 2: Incorporate measured heat loss into existing building survey methods

Why is this important?

This project aimed to enable Domestic Energy Assessors (DEAs) to incorporate measured data into standard Elmhurst property assessment software, thereby providing a route for the industry to access heat loss data that is verified and calibrated to measured data and potentially avoiding the need for a subsequent survey by a heat pump installer. Ultimately, enabling heat pump installers and surveyors to incorporate measured data into their calculations can help achieve better accuracy in heat loss assessments, in turn improving heat pump performance and reducing system costs.

What activities were undertaken?

Elmhurst Energy developed a new BS-EN12831 heat loss calculator which uses much of the inputs and terminology from SAP & RDSAP to standardise where inputs are sourced from and make conversion easier for existing DEAs. Build Test Solutions worked with Elmhurst Energy to incorporate a SmartHTC calculator into the survey software used by Elmhurst-accredited DEAs. The project engaged with DEAs and heat pump installers to gain feedback on the tool and the barriers and opportunities for its use. The project partners also engaged with MCS to understand whether measured data could be incorporated into MCS-approved approaches to calculating heat loss.

What were the project findings, and did the project achieve its objective?

SmartHTC measurements were successfully incorporated into the new calculation tool developed by Elmhurst Energy. This now allows DEAs to use measured Heat Transfer Coefficients (HTC – a measurement of the total rate of heat loss from a building) to improve their property surveys, achieving this objective.

Beyond this objective, the project encountered barriers to including measured HTCs in standard heat loss calculation methods used by MCS-accredited installers.

MCS requires installers to undertake heat loss calculations according to the BS EN 12831 British standard for calculating heat loss for dwellings. However, the BS EN 12831 guidance does not account for incorporating measured HTCs into heat loss calculations, though it does allow for the inclusion of air permeability and U-value measurement. This means calculators that include measured HTCs cannot currently be used in place of purely survey-based methods.

Also, BS EN 12831 heat loss calculations are undertaken on a room-by-room basis so that heat emitters can be sized appropriately for each room, whereas measured HTCs are calculated for the whole house. Using measured HTCs alongside a room-by-room assessment would, therefore, require an agreed-upon method for calibrating room-by-room heat loss to overall heat loss.

The project also found that some installers were concerned about their potential liability for sizing installations incorrectly if they were based on a third-party survey.

However, the project team is actively engaged with MCS, CIBSE, and installers to address these challenges and enable measured heat loss to become a commonplace feature of heat loss calculations for heat pumps.

Objective 3: Promote greater understanding and acceptance of measured data in the heat pump sector by developing a standardised approach to heat loss measurements.

Why is this important?

If measured heat loss is to become commonplace for heat pump installations, the project partners felt it was crucial to develop clear guidance on how to undertake heat loss measurements to ensure a standardised, reliable and replicable process across different methods and technologies. This will allow comparison between results, build trust in the methodology, and help achieve the best outcome for the customer when installing a heat pump.

What activities did the project fund?

The project drafted a standard measurement protocol alongside a publicly available white paper. A website was also created with resources such as case studies, videos, and other documentation to support those undertaking measured heat loss.

What were the project findings, and did the project achieve its objective?

The results and resources released as part of this project can support the sector in undertaking measured heat loss calculations. The guidance developed is technology agnostic, so it is applicable to current and future methods of measuring heat loss from a property. The guidance is impartial, not favouring any technology over another.

Summary

What impact will this have?

This study has shown that using measured heat loss methods can more accurately assess the heat loss of a property. This can lead to a more accurately sized heat pump and avoid over or under-sizing, enabling the heat pump to work more efficiently and thus reduce operational running costs. The project also demonstrated that survey-based methods are likely to oversize heat loss, leading to higher up-front costs for the customer of the heat pump system. Correctly sized heat pumps are also expected to be subject to less cycling and other forms of strain on components, extending the lifetime of the equipment and reducing maintenance costs.

What's next?

The next steps are to continue working with Elmhurst Energy to increase the adoption of the measured heat loss methodology and its training across the heat pump value chain. The project is also looking to build on the results obtained in this study to create CIBSE Technical Memoranda (TM) describing measured heat loss measurements. This will help incorporate measured heat loss into MCS standards.

Where to find out more

More information related to this project and the resources on measured heat loss discussed in this case study can be found at the MEASURED website and the Build Test Solutions website. Elmhurst Energy also now offers training in measured heat loss; more information can be found at the Measured Energy Performance Training on the website.

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