

Infrared Thermography as an Informative Tool in Energy Audit and Software Modelling of Historic Buildings: A Case Study of the Sheffield Cathedral

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Abstract : This paper investigates the extent to which building energy modelling can be informed based on preliminary information provided by infrared thermography using a thermal imaging camera in a walkthrough audit. The case-study building is the Sheffield Cathedral, built in the early 1400s. Based on an informative qualitative report generated from the thermal images taken at the site, the regions showing significant heat loss are input into a computer model of the cathedral within the integrated environmental solution (IES) virtual environment software which performs an energy simulation to determine quantitative heat losses through the building envelope. Building data such as material thermal properties and building plans are provided by the architects, Thomas Ford and Partners Ltd. The results of the modelling revealed the portions of the building with the highest heat loss and these aligned with those suggested by the thermal camera. Retrofit options for the building are also considered, however, may not see implementation due to a desire to conserve the architectural heritage of the building. Results show that thermal imaging in a walk-through audit serves as a useful guide for the energy modelling process. Hand calculations were also performed to serve as a 'control' to estimate losses, providing a second set of data points of comparison.

Keywords : historic buildings, energy retrofit, thermal comfort, software modelling, energy modelling

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