Innovative tool to revolutionize building airtightness test

January 19 2016

The University of Nottingham has developed a novel and easy-to-use test for measuring the airtightness of buildings in order to help eliminate draughts, improve energy efficiency and reduce heating bills.

The testing of airtightness is needed to help establish and minimise the infiltration rate of cold air into buildings and the loss of heated air out through gaps, holes and cracks in the building fabric.

Testing is also required in case the building is too 'tight', as too little ventilation can lead to poor indoor air quality, which in turn can cause adverse health effects for occupants.

Known as the PULSE test, the new airtightness tester has been extensively researched and developed by The University of Nottingham over 14 years and is now being commercialised with industry partners.

Dr Ed Cooper, lead developer of the PULSE test, from the Department of Architecture and Built Environment at The University of Nottingham, said: "The gap between design and performance of airtightness in buildings can at best cause discomfort for occupants and at worst create significant energy wastage and health problems.

"The new test, which is quick and easy to operate, could help mitigate these problems by enabling tests that can be conducted by anyone with minimal training. It could have a big impact on improving the performance of buildings."

The PULSE test releases a short burst of air that creates a low pressure pulse throughout the whole test building, this can then be used to measure the flow through leakage pathways and hence the airtightness of the building.

The latest version of the PULSE test comprises a composite compressed air tank and control box mounted on a compact and portable trolley that can be wheeled into a building for testing.

The test takes only a few seconds and causes minimal disruption to construction work or building occupants.

The current industry-standard 'blower door' technique requires sealing off an external doorway with a fan and blowing air in or out to create a high pressure difference between the inside and outside, which is not representative of normal use.

The blower door, which has been used since the late 1970s, typically takes 15-30 minutes to complete, requires a trained operative and as such is usually only used at completion stage, when it is often too late or difficult to carry out full remediation.

Recent studies in the UK have shown large discrepancies between different blower door operatives testing the same buildings, leading to concerns over reliability.

The PULSE technique is quick and easy enough for construction workers to perform themselves multiple times prior to completion, saving time and test costs later on.

The PULSE testing unit is self-contained and has no need to penetrate the building fabric or block up any doorways.

The results are calculated inside the PULSE unit, which has a user-friendly graphical interface for analysis, and could have the potential to automatically upload to the internet—removing any potential for results to be doctored.

The test also offers accurate and repeatable results by measuring at typical infiltration pressures and accounting for changes in background pressure levels caused by the wind or outside temperature.

The PULSE test has garnered over £1m in funding throughout its development, including an EPSRC First Grant which helped to secure proof of concept and an InnovateUK grant for further software and product development with industry partners.

The University is currently in negotiations to licence the technology to a joint venture, consisting of Elmhurst Energy, National Energy Foundation and Absolute Air and Gas—to make the PULSE test a commercial reality.

The PULSE test also recently secured funding to be a pilot project for the £4.5m 'Built 2 Specification' (Built2Spec) initiative, which aims to revolutionise the way Europe delivers green buildings.

Funded by the European Commission's Horizon 2020 programme, Built2Spec aims to use innovative new technologies to transform the construction industry and help the EU hit 2050 carbon targets.

Working alongside 20 partners in eight countries, such as the Passivhaus Institute, Lakehouse, BSRIA, VRM Technology, OHL, Nobatek and TNO, the PULSE will be developed for integration into the Built2Spec Virtual Construction Management Platform to help reduce the gap between design and performance of buildings.

Provided by University of Nottingham