ECCO STOVE

UNIVERSITY OF BIRMINGHAM

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An excerpt from a University of Birmingham publication on Ecco Stoves, and how their use of silicon carbide optimises heat distribution and heat balance throughout a house.

"HOT STUFF…

A collaborative project between a West Midlands SME, Landy Vent, and the University of Birmingham has evaluated the performance of the Company's unusual heating system and provided some interesting results.

Landy Vent's new 'ECCO Stove' uses age old principles but is made with silicon carbide to maximise efficiency, create lower emissions and decrease running costs. The whole structure of the ECCO Stove features silicon carbide which enables very high temperatures to be reached in the combustion chamber (typically 900– 1000°C). The benefit of using such material is that silicon carbide is able to reflect heat back into the fire chamber for higher burn temperature; absorb these extreme temperatures and then release the heat slowly. The heat conduction properties of silicon carbide are primarily used in electrical conductors and furnaces but have not been traditionally used in home heating systems. Landy Vent wanted to demonstrate the benefits of the ECCO Stove and approached the Manufacturing Advisory Service (MAS) for advice. MAS suggested that they talk to experts in thermofluids from the University of Birmingham.

Researchers from the University's department of Mechanical Engineering, Dr Raya Al-Dadah and Dr Saad Mahmoud, set about installing temperature measuring devices connected to dataloggers and continuously monitored the temperature in a two-storey 'test' cottage where the ECCO Stove had been installed. Of particular interest was the temperature distribution throughout the cottage, in various positions and levels, not just at the location of the stove. Both the ECCO Stove and a more conventional metal stove were tested consecutively with temperatures being logged every 10 minutes over a three day period in cold January.

The results showed that there was a greater reduction in the temperature difference with distance from the metal stove, indicating that the effect of the metal stove decreases with distance. This could be due to the innovative use of silicon carbide producing a lower thermal capacity than that of the metal stove. The larger thermal mass of the Ecco Stove allowed heat to be released more evenly and consistently allowing the stove to maintain uniform temperature throughout the building."

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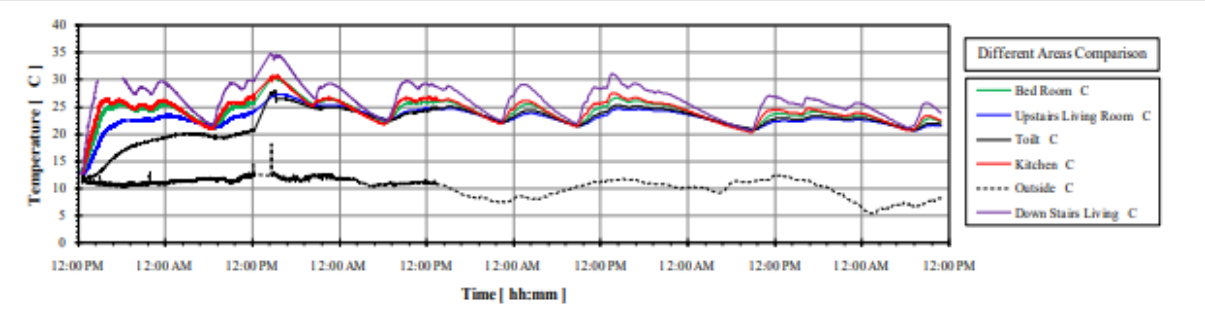
Ecco Stove Performance Evaluation:

Ecco Stove performance evaluation It is of vital importance to the Ecco Stove team that we can back up what we know about how our product performs with factual evidence for our dealers and end users. As such when the opportunity arose to perform tests on the Ecco Stove with Birmingham University we jumped at the chance. The Aim The purpose of the tests were to decipher and prove how the stove is able to distribute balanced heat through the home in the unique manor that we had seen time and again. The Parameters: We would use the E678 model as an example in a poorly insulated stone built property with two floors. Thermocouples were positioned by the university throughout the home to test the ambient temperatures in each room and monitored by a university post graduate. In a completely separate test joss sticks were positioned through a second property to establish how the heat moved through the house.

The Results of the temperature:

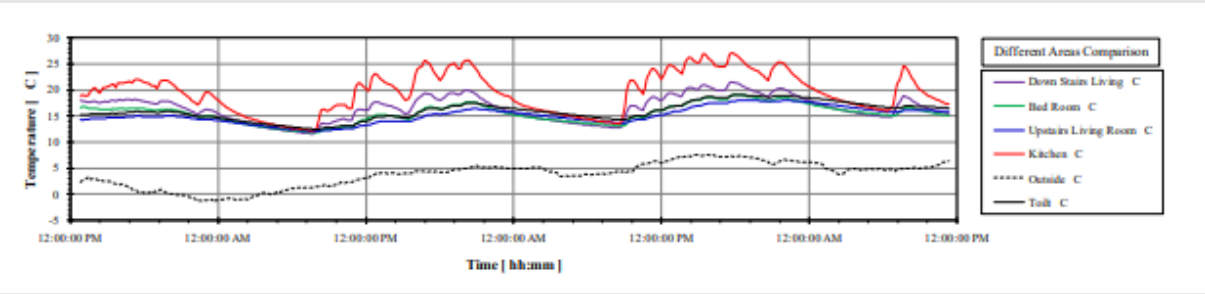
In the graph below you can see the heat distribution and retention over 12 hour time frames showing the average room temperatures heated by the Ecco Stove were between 22°c and 27°c through the home. This showed a balanced and comfortable heat through the home from a single source.

Ecco Stove E678 average room temperatures:



The average room temperatures heated by the metal stove were between 13°c and 22°c showing a greater disparity. The metal stove warmed predominantly the area directly around it and leaving other rooms 16°c and below.

Metal 9kw Stove average room temperatures:



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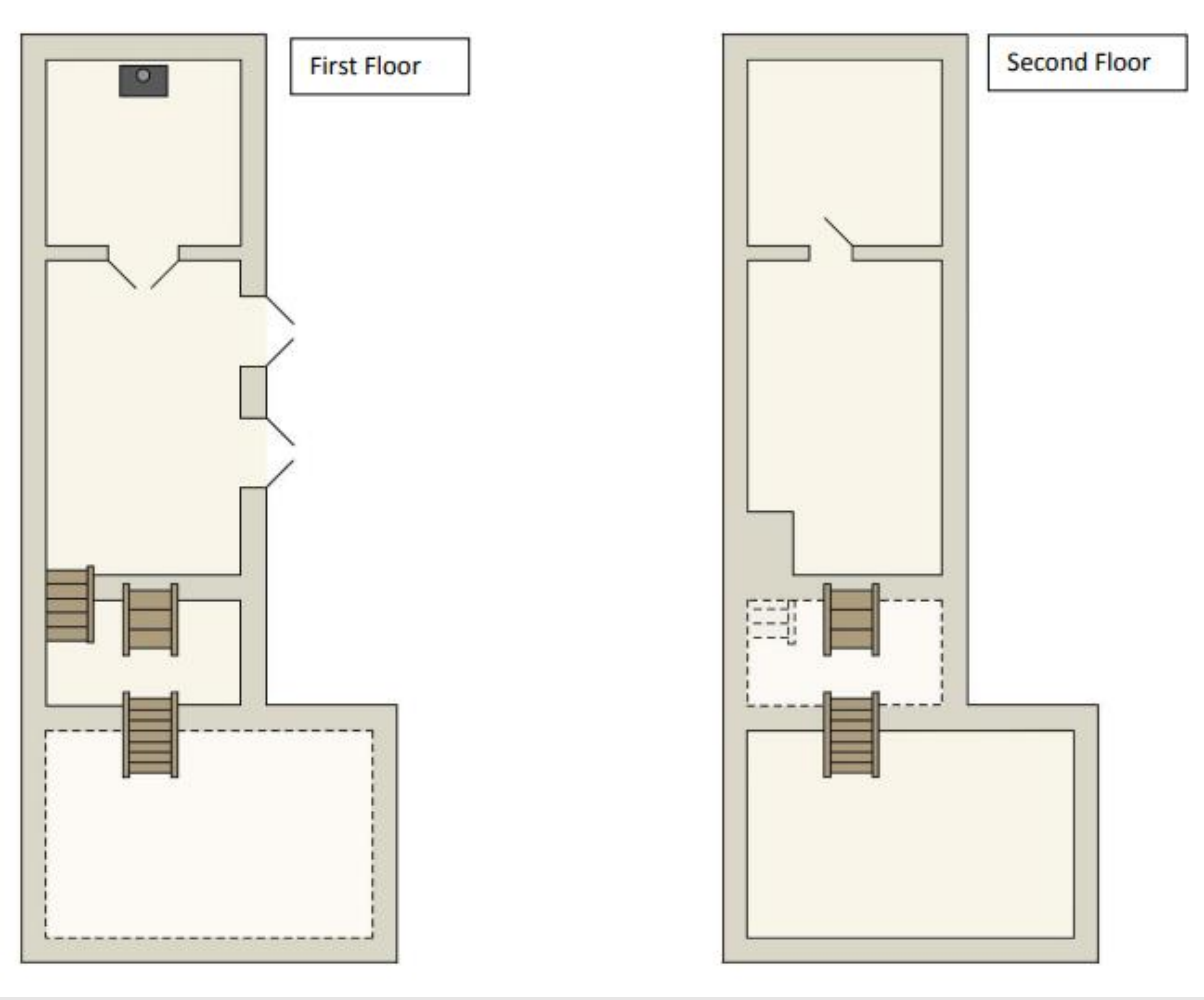
The Ecco stove was tested again separately at external temperatures between -6°c and -9°c to ensure the results were more than fair and gave temperatures through the home of between 18°c and 24°c still only showing a 6°c difference. (shown in 3 month study) The heat loss was also measure over a distance as you moved away from the stoves. With the Ecco stove there was a difference of 0.5°c at the mid-level heating point of the cycle from a distance of 1-7metres. With a metal stove over the same distance there was a difference of 3°c. This showed categorically that where a conventional metal stove was very good at heating a room it failed to properly heat the home, where as the Ecco Stove not only sent a balanced heat through the home but also the ambient temperature was never too great in the initial room. Ecco Stove maintained the property at an average of 24°c for 3 days and refuelled 3 times in 24 hours, whereas the metal stove maintained an average of 15°c through the house for only 2 days and required refuelling every 2 hours and produced no heat 1 hour after refuelling.



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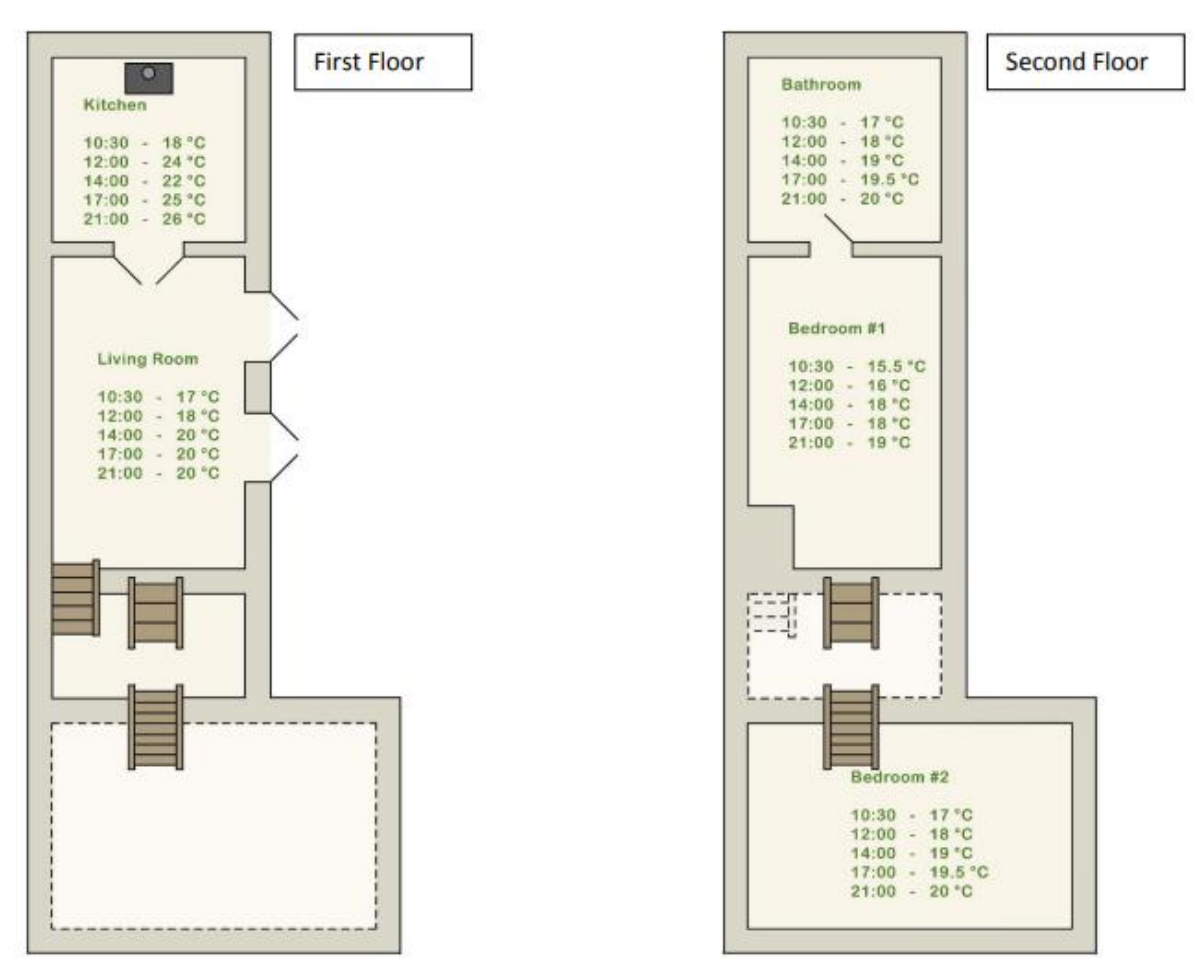
This was a 10 hour test and shows the heat through the ground floor area (not open plan) with the Ecco Stove (E580) situated in the kitchen. This also shows how the Ecco Stove copes with distance and changing levels.



The Bathroom is the hardest area for the heat to penetrate having to pass from the kitchen, through the living room, up the stairs, through bedroom #1. The heat difference between the stove and the Bathroom (the furthest room) at 17:00 the temperature difference is only 5.5°c (about 1°c per room difference) with 6°c external temperature.

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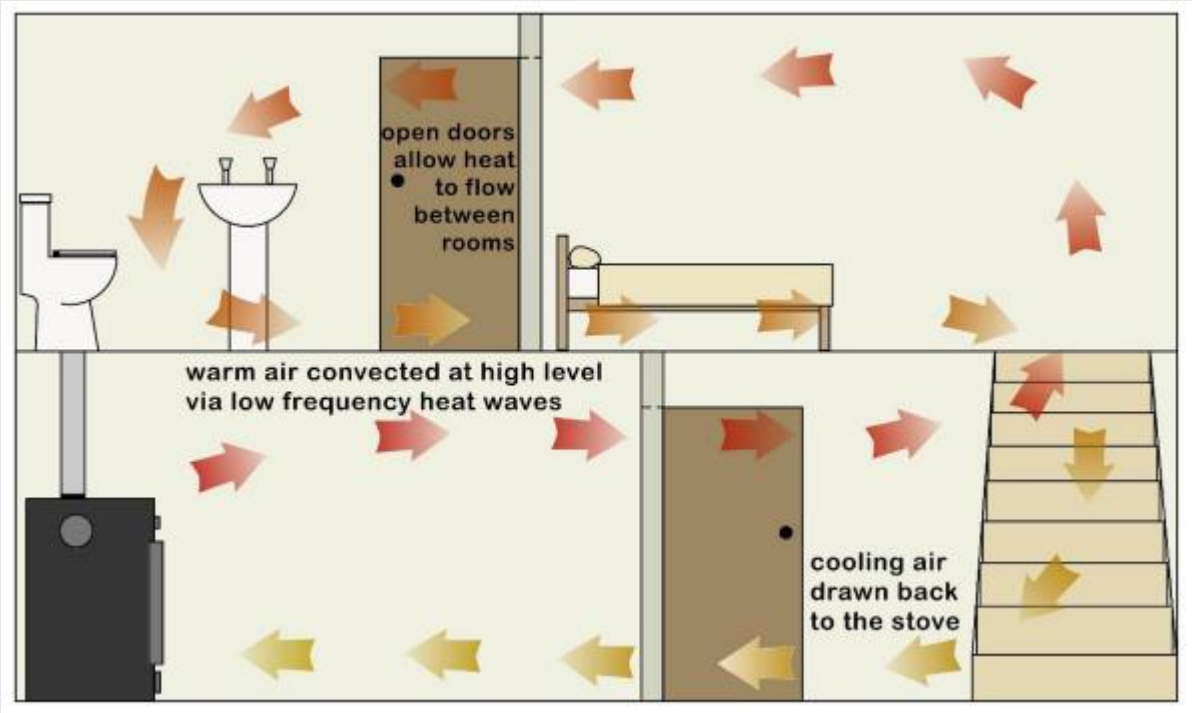
How?

The final test carried out involved the joss sticks and examining the heat movement through the home via following the smoke trail. What was found was the hot air travelled at a high level as one would expect through each doorway connecting through the home simply by having open doors. Simultaneously as the air cooled it was drawn back to the stove through each door at a low level and consequently circulating and warming the air in the house. (As the diagram below shows)



As the stove is continually heating the air the returning air is warm as opposed to cold giving a balanced temperature

Conclusion:

Utilising the unique properties of silicon carbide and the design of the Ecco Stove we have proven that the home can be heated throughout at a balanced heat from a single source without the need for plumbing, ducting or electrics. With a slow distribution of heat the air is circulated and warmed as opposed to blasting with a short burst of heat generated from conventions wood burning stoves.

You can see the link to the full article below:

https://www.birmingham.ac.uk/Documents/partners/rcs/think-business-issue-6.pdf