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PII: S2352-7102(18)30371-1
DOI: https://doi.org/10.1016/j.jobe.2018.08.006
Reference: JOBE558

To appear in: *Journal of Building Engineering*

Received date: 4 April 2018
Revised date: 26 July 2018
Accepted date: 11 August 2018

Cite this article as: E. Enríquez, V. Fuertes, M.J. Cabrera, Jaime Seores, David Muñoz, W. More and J.F. Fernández, Model to evaluate the thermal comfort factor: Dynamic measurement of heat flow in building materials, *Journal of Building Engineering,* https://doi.org/10.1016/j.jobe.2018.08.006

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Abstract

Thermal comfort in buildings is pursued by improving efficiency in energy consumption and by developing warmer materials. However, the thermal comfort concept is not clearly defined and subjective parameters come into play, making it difficult to translate to physical parameters. For this reason, in this work, a method to measure the dynamic thermal comfort of materials is developed based in the thermodynamic laws and the heat transfer, leaving subjective parameters aside, and proposing a scale of the thermal comfort factor for the different materials. For this purpose, a device has been designed to determine transitory regime of heat flow provided by a material when it gets in touch with a simulated human finger, in order to mimic the human sensation when stepping on a pavement material. These experimental set-up measures the cooling curves of a material taking into account the main parameters that can affect the dynamic heat flow. The results obtained from this procedure allow stablishing a thermal comfort scale where the different materials could be categorized. In addition thermal conductivity and heat capacity have been measured in order to correlate the thermal properties with the results obtained, and a simulation study has been carried out to confirm them.

Keywords: Dynamic thermal comfort; transitory regime; conduction mechanism; measurement device.

1. Introduction

Nowadays, the thermal comfort improvement inside the buildings is still a challenge apart for obtaining r people satisfaction, which is shown to improve work efficiency and personal health, but also for the energy saving. Today eco-designed buildings rationalize the use of energy keeping comfort, improving the habitability [1–4]. As example, the thermal comfort efficiency can be improved by reducing outside heating with solar reflection coatings or by using high thermal