NUMERICAL SIMULATION STUDY ON THE HEAT LOSS FROM A THERMAL FOOT MANIKIN

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INTRODUCTION

The development of increasingly complex human thermal physiological and comfort models asks for anatomically detailed and zone-specific heat transfer coefficients. With that in mind, a 3D numerical simulation model was developed to study the fluid flow and the heat transfer phenomena around a multi-zone thermal foot manikin, during exposure to convective currents.

METHODS

The simulation model features heat transfer by conduction, natural and forced convection and radiation, as well as fully coupled fluid flow and heat transfer phenomena. The environmental conditions used in the simulations mimic those of standardised manikin testing (e.g. ISO 15831). The model was used to analyse the flow characteristics and to obtain detailed heat loss distributions maps at the foot surface.

RESULTS/DISCUSSION

The obtained numerical heat transfer coefficients compare favourably with data from experimental measurements with a multi-zone thermal foot manikin, as well as with the results obtained by other researchers (de Dear et al. 1997). This lends support to the modelling decisions done (fluid flow model, boundary conditions, etc.) and indicates that similar approaches can be followed to study the heat loss from a foot (or other body zones) for other operating conditions (convection currents, temperature gradients, radiant environments, etc).

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