Energy Saving Potentials Of Infrared Reflective Wall Paints And Their Effect Of Thermal Comfort

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Abstract

Infrared reflective wall paints and layers can be used in building assemblies to reduce the heat transfer. The application of infrared reflective wall paints has, therefore, been studied under a variety of boundary conditions and assembly configurations. While the resulting heat transfer has been rated as of high interest, less attention is paid on thermal comfort. This paper shows the modeling process and applied physics to create a model that can predict the heat transfer and the thermal comfort of a simple human replica model. The study uses the COMSOL Multiphysics® Heat Transfer Module, where heat transfer in solids and fluids, surface-to-surface radiation and laminar flow are integrated into the model. The energy saving potential for various configurations e.g. applied insulation thickness, emissivity of the IR reflective wall paint and heating power is presented. The results are linked towards the thermal comfort, which enables a better assessment of the maximum energy saving potential. Critical scenarios in terms of the negative influence caused by radiative asymmetry and wall surface temperatures close to the dew point are outlined.