Thermal comfort of patients in healthcare facilities

Jan Verheyen

Thermal comfort is an important aspect in providing an adequate indoor climate, especially in healthcare facilities. For patients, thermal environment may induce physiological stress, additional to stress related to the disease, post-surgery or injury of the patient. This stress may even impose life-threatening conditions. In this dissertation thermal comfort of patients in healthcare facilities is studied.

Differences in thermal environmental conditions required for acceptable global thermal comfort are detected for staff, visitors and patients. Largest discrepancies are seen between staff and patients in a chair in summer and between patients in the bed or staff and patients outside the bed in winter. These results are obtained using standards and existing methods that neglect every influence of disease, injury, post-surgery, treatment or other aspects related to the healthcare setting.

To provide insight in this influence, global thermal comfort perception of patients in 6 wards in a Belgian healthcare facility is obtained by questioning and compared to results of existing thermal comfort models. The results indicate that models, currently in use for healthy people, adequately predict mean thermal comfort perception for the majority of patient population for the wards considered except for neurology ward. Adaptive thermal comfort theory may not be suitable for application for patients without careful consideration of the limited possibilities to adapt. This research approach can be continued for extended number of patients and for other wards to provide a go/no go prerequisite decision for applying standard methods for determination of global thermal comfort.

To gain more insight in the case of a patient lying in bed, local thermal comfort of a human lying in bed is studied using different existing models. These models include local thermal sensation and comfort, thermo-physiology and –regulation and computational fluid dynamics (CFD). CFD is used for simulation of heat transfer and airflow around the human body and determination of mattress local total thermal insulation values. The influence of thermal insulation provided by the bedding system on local thermal comfort or sensation is visualized. The influence of disease, injury, post-surgery, treatment and other healthcare specific aspects is neglected. The application of the method and results can be broadened to resting environments in general.

Keywords: global and local thermal comfort, patient room, healthcare facility, Computational Fluid Dynamics (CFD), bedding system.