Development of sustainable thermal and visual comfort models

C. Pina Santos, M. Rebelo, L. Matias, and A. Santos
National Laboratory of Civil Engineering (LNEC), Lisbon, Portugal

S. Almeida
Foundation for Science and Technology (FCT), Lisbon, Portugal

ABSTRACT

This paper presents the main results of an interdisciplinary research study carried out by LNEC. The study aims at understanding and influencing the evolution of thermal comfort and daylight requirements, considering specific Portuguese characteristics and the need to limit unjustified energy use in buildings.

This increased energy consumption may reveal greater user comfort requirements and expectations. But it may also reveal design and lifestyle trends conducting to unsustainable options concerning construction, rehabilitation and everyday use of buildings.

As a matter of fact, some contradictory aspects can be detected: a greater intolerance in relation to exterior climate variations; the creation of indoor climates which frequently do not provide the desired well-being conditions (in working, leisure or living places); unnecessary and excessive energy consumption.

In Portugal there is a growing tendency for the use (and abuse) of air conditionings systems, in particular in service buildings, transports and, more recently, in residential buildings. The systematic and permanent use of electric lighting in the service and the residential sectors is also a common practice.

The study that LNEC's multidisciplinary team is carrying out considers both physical (objective) and behavioural (subjective) factors. This ongoing research is based on extensive field surveys of office, multifunctional and educational buildings, elderly homes and conventional residential buildings. Socio-cultural and climate (temperate Mediterranean) diversity is being considered.

In the context of the perception of thermal and visual indoor environments, along with detailed measurements of relevant indoor environment parameters, questionnaires were designed to study the influence of adaptive processes, namely of behavioural, physiological and psychological nature.

An adaptive thermal comfort model and a comprehensive integration of the behavioural patterns and the energetic impacts in dynamic day lighting modelling have been developed.

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