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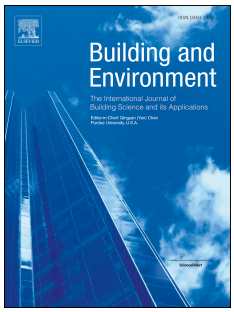

Field study on adaptive thermal comfort in mixed mode office buildings in southwestern area of Spain

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Abstract

The design of the mode of operation of heating, ventilation and air-conditioning systems in office buildings has become increasingly important in recent years. This is due mainly to their relationship, both with the comfort of their occupants and with energy efficiency. The adaptive thermal comfort theory addresses this problem by linking the indoor comfort temperature with the outside temperature. This idea represents a relaxation in the presence of strict set-point temperatures. This results in a greater tolerance of the indoor environment and thus, in a wider range of acceptability on the part of the occupants of the buildings. Nonetheless, and although previous studies have been carried out on naturally ventilated buildings, there are no standards or application guides for hybrid buildings. This study shows the applicability of the adaptive model to hybrid buildings. An adaptive model for hybrid buildings is proposed, valid for both the free-running and air-conditioned modes, based on a field study carried out in the southwestern region of Spain. A total of 4.243 responses in mixed mode buildings and a total of 891 in air-conditioned building were collected over the period of a year. The comfort temperature in hybrid buildings was observed at an average operative temperature of 23.6°C. The results show the energy-saving potential of hybrid buildings, without foregoing the comfort of their occupants, and show that it would be possible to implement a law that optimizes the operation of conditioning systems and which would undoubtedly lead to greater energy efficiency in such buildings.

Keywords: field study; adaptive thermal comfort; mixed mode buildings; adaptive model