

Abstract

Building energy use accounts for up to one-third of world energy utilization and emissions. Building comfort standards deeply influence this energy use. The need of the hour is energy efficient and sustainable buildings that do not sacrifice thermal comfort. In this regard, great promise has been shown by the adaptive models of thermal comfort. Worldwide, field studies show that people have considerable capacity to adapt to their surroundings provided they have sufficient opportunities. The current work explores thermal comfort zones of naturally ventilated classrooms in tropical regions of India and the applicability of adaptive comfort standards in such classrooms.

Thermal comfort field studies were conducted in naturally ventilated laboratories and classrooms of Indian Institute of Technology Kharagpur. Kharagpur is located in the tropical climatic region of India, Köppen climate type Aw. Survey results showed a strong correlation between indoor comfort conditions and outdoor temperature. Student responses showed affinity to indoors of naturally ventilated buildings and at the same time empathy to a naturally ventilated building's environment friendly nature.

Comparison of classroom learning performance between courses taught in naturally ventilated rooms and air-conditioned rooms showed that performance remained independent of comfort standard followed — PMV based or adaptive thermal comfort. Thus, performance in a well designed NV classroom can be as good as in AC classrooms.

Analysis of results from our comfort surveys, and those of others performed in the tropical climatic regions of India showed that the adaptive comfort equation from European comfort standard, EN15251, may be used as a reasonable predictor of comfort in naturally ventilated buildings of hot-humid Indian regions and such use would also result in major energy savings.

Based upon observations from the surveys, certain remedial strategies have been suggested that can contribute to improved comfort and compliance with adaptive comfort standards. These recommendations encompass building passive cooling features as well as enhanced adaptive opportunities for students.

Overall results showed that the classrooms examined provided a comfortable learning environment to students over a major period of their occupancy. With subtle 'adaptations', comfort in these classrooms may be even further improved.

Key words: adaptive thermal comfort; thermal comfort survey; comfort standards; classrooms; hot-humid climate; natural ventilation