



Operative temperature and thermal sensation assessments in non-air-conditioned multi-storey hostels in Malaysia

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ABSTRACT

This study assessed the influences of operative temperature on occupants' perceptions of indoor thermal condition in three non-air-conditioned multi-storey hostels in Klang Valley, Malaysia. The thermal conditions of 24 measured rooms were recorded with and without an operating ceiling fan from May until July 2007. Measurements were made simultaneously at three different floor levels, namely, at the first, fifth and top floor of each of the case study hostels. A questionnaire survey was completed by 298 female student occupants of the same case study hostels. The results suggested that even though a significance above $p < 0.01$ was recorded between the operative temperatures with and without fan operation, the temperature difference remained small, i.e., from 0.5 K to 1 K. The findings of the questionnaire survey showed that the occupants perceived the thermal conditions in rooms that were shaded with a projected balcony (shading ratio of 0.9), a long roof overhang (shading ratio of 1.6) and an operable window-to-wall ratio of 0.3 to be thermally comfortable.

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1. Introduction

In Malaysia, thermal discomfort complaints were mostly recorded in concrete modern houses that are none permeable and porous unlike Traditional Malay Houses that were built using timber, local, and organic materials [1,2]. The erection of these concrete modern houses was influenced by western architecture style, which did not relate to local climate, geography and cultural context. Nowadays, due to increasing land value, the government of Malaysia encourages more multi-storey dwellings to be built [3,4]. Moreover, due to the high numbers of individuals attending colleges, the Malaysian government is looking into the mass production of multi-storey hostels in college campuses [5]. Why do we need to assess the indoor comfort perceptions of student occupants staying in non-air-conditioned hostels? In an earlier survey conducted by Dahlan et al. [6] suggested that student occupants were more concerned with their rooms' thermal condition then followed by acoustics and finally visual conditions. Nevertheless, due to its low cost nature, the hostels in Malaysian college campuses are usually non-air-conditioned but equipped with a ceiling fan in each room.

This paper describes the results obtained from thermal assessments conducted through objective and subjective measurements

in non-air-conditioned multi-storey hostels in Malaysia. 24-h monitoring of operative temperatures for both with and without ceiling fan usage in the selected case study buildings were conducted. Afterwards, questionnaire surveys were administered to the occupants of those case study buildings. It is expected that a desirable window design based on the occupants' responses regarding thermal comfort could be obtained.

2. Methodologies

2.1. Case study selection and measured room specifications

The three selected high-rise hostels were the Twelfth Residential College, Universiti Malaya, Petaling Jaya (H1); the Eleventh Residential College, Universiti Putra Malaysia, Serdang (H2); and Murni Student Apartment, Universiti Tenaga Nasional, Bangi (H3). During the field measurement in H1, dry bulb temperature and external relative humidity data from the Petaling Jaya meteorological station were used. Similar types of data collected from the KLIA meteorological station were used in H2 and H3. The synoptic weather conditions were observed from two weather stations in Petaling Jaya and the Kuala Lumpur International Airport (KLIA), which are situated about 30 km apart from each other. Table 1 presents the recorded monthly average meteorological data collected from Petaling Jaya (1971–2006) and KLIA (1998–2006) weather stations. The data range indicates that the selected

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