



A comparison of the occupant comfort in a conventional high-rise office block and a contemporary environmentally-concerned building

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ABSTRACT

A comparative study of the occupant comfort (neutral) in a conventional high-rise office block and a contemporary environmentally-concerned building for Sheffield UK climate conditions was carried out. A questionnaire was designed for occupants to rate their workplace environment in terms of the thermal, visual, acoustic and overall perception and satisfaction level. The basic physical parameters were measured at the same time, e.g. air temperature, humidity, illuminance and sound level. It is inferred that (1) There is a noticeable difference between the conventional building and environmentally-concerned building in terms of their thermal and visual environment. (2) A clear distinction of the occupant sensation and satisfaction level towards their thermal and visual environment is presented between these two buildings. (3) The effect of basic physical variables on the occupants' perception and satisfaction level becomes less significant when minimal standards are attained. (4) The acoustic satisfaction level however, was not perceived differently by the occupants of the two building types.

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1. Introduction

Issues regarding building stock are highly important in the quest to reduce overall energy consumption and finding prime targets for cuts in carbon emissions. Nowadays, much work has been done in the attempt to find potential solutions to the problems of energy efficiency and environmentally friendliness in the building design. Natural ventilation with environmental design consideration is always encouraged as an appropriate solution. In order to give confidence to embark on the design of environmentally-concerned buildings, the impact of these buildings on the built environment is often tested during the design stage and after its completion and in use [1–5]. However, there is little empirical evidence to support that the occupants' perception and experiences are been addressed in these buildings.

However, lots of work has been done in terms of the occupants' thermal sensation and comfort. De Dear and Brager [6] summarise an adaptive comfort research by ASHRAE. It presents some of its findings for naturally ventilated buildings and discusses the process of getting the Adaptive Comfort Standard (ACS) incorporated into ASHRAE Standard 55. Based on the analysis of 21 000 sets of raw data compiled from field studies in

varied buildings, they find that occupants of NV buildings prefer a wider range of conditions that more closely reflect outdoor climate patterns. A hypothesis is also raised that indoor comfort temperatures in NV buildings are strongly influenced by shifting thermal expectations resulting from a combination of higher levels of perceived control, and a greater diversity of thermal experiences in such buildings.

Feriadi and Wong [7] conduct an extensive field survey towards the occupants' thermal comfort in naturally ventilated buildings in Indonesia. 525 respondents are involved in this survey in both dry and rainy seasons. They find that occupants of naturally ventilated housings show higher thermal comfort level when compared with predicted mean vote which is believed because of the adaptive actions. Their thermal comfort is to a great extent affected by non-physiological factors which go beyond the basic environmental factors, such as temperature, RH, air movement etc. Furthermore, a lower temperature is found preferable by the occupants than the neutral temperature showed.

Wagner et al. [8] conduct a field study involving 50 subjects of a low energy office building in Germany. Questionnaires are filled in by participants twice a day every two days in 4 weeks in summer. The air temperatures and relative humidity are also recorded continuously during the survey time. They conclude that naturally ventilated and passively cooled buildings can be highly appreciated by occupants during summer if they are designed properly in terms of the indoor climate.

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