



Literature survey on how different factors influence human comfort in indoor environments

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ABSTRACT

The present paper shows the results of a literature survey aimed at exploring how the indoor environment in buildings affects human comfort. The survey was made to gather data that can be useful when new concepts of controlling the indoor environment are developed. The following indoor environmental conditions influencing comfort in the built environment were surveyed: thermal, visual and acoustic, as well as air quality. The literature was surveyed to determine which of these conditions were ranked by building users as being the most important determinants of comfort. The survey also examined the extent to which other factors unrelated to the indoor environment, such as individual characteristics of building occupants, building-related factors and outdoor climate including seasonal changes, influence whether the indoor environment is evaluated as comfortable or not. The results suggest that when developing systems for controlling the indoor environment, the type of building and outdoor climate, including season, should be taken into account. Providing occupants with the possibility to control the indoor environment improves thermal and visual comfort as well as satisfaction with the air quality. Thermal comfort is ranked by building occupants to be of greater importance compared with visual and acoustic comfort and good air quality. It also seems to influence to a higher degree the overall satisfaction with indoor environmental quality compared with the impact of other indoor environmental conditions.

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1. Introduction

In developed countries people spend more than 90% of their time indoors. Indoor conditions have therefore far-reaching implications for their health, general well-being and performance. Numerous studies have explored how building users perceive the indoor environment and which conditions are considered to be comfortable. In indoor environments, a number of physical and chemical parameters have been identified that influence the comfort of building occupants. Standards dealing with indoor environmental quality have been developed to define the acceptable ranges of these parameters. Even though the requirements of these standards are met, not all building occupants are satisfied with the indoor environment. In addition, the same indoor conditions may lead to different subjective responses. One obvious reason is that people differ and therefore not all are satisfied by the same conditions. Another reason could be that not only physical conditions influence satisfaction with indoor environments. There

may also be other factors, unrelated to environmental quality, that influence whether indoor environments are considered to be comfortable or not; these factors are usually not regulated by the standards.

Previous literature reviews examining the issue of comfort of building occupants in indoor environments were focused mostly on the effects of single environmental conditions on humans. For example, reviews were made investigating which conditions lead to satisfaction with the visual environment [1] or with the acoustic environment [2]. Some reviews examined which factors not related to the indoor environment may influence preference for indoor environmental conditions. These reviews again focused on satisfaction with a single environmental condition, e.g. the visual environment [3] or the thermal environment [4,5]. No review has been carried out summarizing the possible influence of different non-environmental factors on whether overall indoor environmental quality, being an interaction of thermal, visual and acoustic conditions as well as indoor air quality, is evaluated as comfortable or not. The present literature survey was performed to gather more information on this matter.

The objective of the present literature survey was to investigate what constitutes comfort for building occupants. This knowledge is

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