ASSESSMENT OF WINDOW AND LIGHTING DESIGN IN OFFICE BUILDINGS UNDER DAYLIGHT OF A HOT-HUMID CLIMATE, MALAYSIA

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ABSTRACT

Office buildings in Malaysia can be characterised as being highly depended on electric lighting despite of the brightness and high availability of daylight. Generally, daylight has not been taken full advantage of, largely because the problem of glare giving rises to visual discomfort. Highly tinted solar glazing and shading devices are therefore used to protect office interiors from sunlight and glare, and so this reduces daylight.

The general aim of the study is to explore the potential use of daylight in the office environment, thus, to reduce the dependency on electric lighting and to create the potential for a more pleasing daylit environment. The thesis firstly reviews the development of window and lighting design in office buildings in Malaysia in comparison to western countries. It reviews the theory of visual comfort and the characteristics of Malaysian daylight.

The thesis has investigated glare, seating orientations, window design, preference of lighting, lighting and visual comfort regulation, visual comfort and visual performance and computer simulation on glare in Malaysian offices. It has developed tools for assessing the visual environment in offices (in the field), focusing on the Malaysian conditions of daylight in office design. Specifically, it has investigated the current window and lighting application in office buildings through office workers' assessment using a questionnaire survey. It has assessed the current window and lighting application in office buildings based on field measurements. It has assessed visual and lighting condition and visual task performance using a Landolt Ring chart under a daylit office environment. Finally, it has analyzed glare of a daylit office using computer simulation, Radiance.

The major findings of the thesis show that a daylit office can be successfully used to provide an acceptable visual environment and reduce electric lighting within. However, there are some qualifications to this conclusion. Firstly, it has been found that daylight should be controlled either using tinted glazing or shading devices. Secondly, the acceptable of a daylit environment depends to a certain extent on seating positions relative to windows. Interestingly, the best rated seating position reported by subjects is the least productive for visual task performance. Finally, it appears that glare calculation used in the advanced computer program is not suitable to calculate glare for Malaysian daylight condition. The western guidelines for visual comfort can be applied as general guidelines, with caution that Malaysian daylit conditions are expected to include a wider range of daylight levels.

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