

Internal shading for efficient tropical daylighting in Malaysian contemporary high-rise open plan office

Abstract:

In tropical climate, there is actually abundant quantity of daylight but yet to be utilised. The excessively high and unpredictable external illuminance could cause non-uniform indoor illuminance distribution and visual discomfort. In order to improve daylighting quality in contemporary high-rise open plan offices, proper design of internal shading should be investigated. A base model was derived from previous case studies for simulation using Radiance. Various venetian blinds, vertical blinds and light shelves were configured for the experiment. Daylight factor (DF) was evaluated for quantitative performance; work plane illuminance (WPI) distribution and vertical plane luminance ratio were investigated for qualitative performance. The findings demonstrated that generally blinds were not a good potential for daylight utilisation but good in reducing luminance contrast. Light shelves improved performances in DF and WPI distribution but increased the luminance contrast. Hence, integrations of light shelves and partial venetian blind (45 closed) were proposed as the effective designs for all orientations. The highest improvements of 31.8% in WPI distribution and 66.7% in luminance ratio were achieved for south and east orientations, respectively. This paper demonstrates that with proper internal shading design, effective daylighting depth can be significantly improved from typically used 2.5 H rule of thumb to 3.6 H.