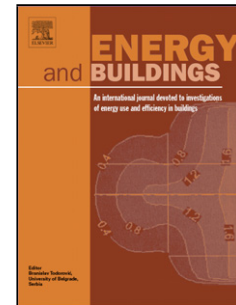


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Using Integrated Parametric Control to Achieve Better Daylighting Uniformity in an Office Room: A Multi-Step Comparison Study

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ABSTRACT

In addition to windows, louvers are the most common architectural elements widely used in office buildings to protect them from excessive daylight and improve daylight penetration as well. Advanced glazing, window blinds, other fenestration systems and their automation can further improve daylighting performance. However, the stability and uniformity of daylight distribution throughout a day inside a building remain a challenge. To explore a solution for this issue, this paper proposes an advanced integrated lighting system combining different architectural elements, which can be controlled parametrically. The suitable design of such integrated system is identified through a multi-step comparison study employing parametric design approach. The criteria is to keep a relatively uniform daylight distribution in the range of 300 – 500 lux over 90% of the whole desktop area in a 7-meter-deep office room. An office building in New Cairo was chosen for a case study, where it is south oriented with a prevailing condition of clear sky. Hourly results on the 21st of several chosen months are given to show the suitability of the proposed design throughout a year, aiming to explore the maximum use of daylight and hence reduce the energy consumption of electrical lighting. The comparison indicates that the combined use of the integrated system can achieve a satisfactory relatively uniform distribution of daylight over about 90% of the desktop area, within illuminance range of 300 – 500 lux for most of the working hours throughout a year.

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