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A Comparative Study of Various Daylighting Systems in Office Buildings for Improving Energy Efficiency in Egypt

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Abstract

Effective utilization of Daylighting Systems (DLS) in buildings has the potential to maximize the benefits of daylighting, reduce energy consumption, and achieve a quality building environment for the users. Even though the number of possible alternatives that can be generated for integrating DLS in buildings is immense, the number of DLS alternatives simulated and analyzed in previous research has been fairly limited. Therefore, this paper focuses on expanding the number of design alternatives to be simulated and analyzed for integrating DLS individually and collectively at both individual zones and in the whole building, including at different orientations, in order to better inform and enrich design decisions for selecting the best alternatives of DLS that can achieve the highest energy performance for office buildings in a hot climate zone such as Egypt. Daylighting and Energy simulation are conducted for these alternatives, along with visual and comfort analysis.

The results of conducting a comparative study of various DLS in Office Buildings in Egypt include identifying optimal alternatives for improving energy efficiency. Results indicate that HSD and HST, whether individually or collectively, can achieve the highest savings, with a reduction of 40% in the energy consumption of cooling and lighting, while HLE saves 38% and HBI saves 24% of the energy consumption for cooling and lighting. The paper concludes with a developed guide to be used by

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