Analysis of daylight metrics based on the daylight autonomy (DLA) and Lux illuminance in a real office building atrium in Tehran

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Abstract

There is a wide range of studies based on the effect of reflectance ~~that~~ which is one of the main parameters for assessing daylight in an atrium office building considering the structure of a construction. Daylight factor (DF) is announced as the main variable for depicting different diagrams and deriving some crucial conclusions; ~~however~~meanwhile, other factors ~~like~~ such as daylight autonomy (DLA) in parametric simulation consideration could show some significant outputs. Office buildings are as important as residential places for spending time. Hence, saving energy and optical comfort should be managed based on the structural aspects of a building. Accordingly, this paper ~~is focusing on~~deals with reflectance features~~,~~ and Well Index as the main parameters for showing different structures. For obtaining the optimum illuminance, validation and simulation is done based on the real atrium office building in Tehran Kaveh office building ~~is done~~. The results ~~show~~ revealed that the reflectance distribution on a uniform model and a striped model (a uniform wall surface ~~is contained (UB and UW)~~consists of either uniform black (UB) and uniform white (UW), and the striped one ~~is contained~~consists of alternating horizontal and vertical bands of black and white colors), and geometries of a building (WI from 0.4 to 2.1) could have a significant effect on the vertical daylight autonomy (DLA)~~,~~ and lux illuminance. When the ~~well~~ Well index ~~is~~ was 1.3, and the dimension of the atrium well in the Kaveh office building ~~is~~ was as follows: ~~(~~Length: 31.5 ~~(~~m~~)~~, Width: 10 ~~(~~m~~)~~, Height: 20 ~~(~~m~~))~~, and the reflectance distribution ~~is~~ was horizontal ~~one~~ with the black color at the top of the wall with a reflectance of 0.02, and one white band in below with a reflectance of 0.85, the result is the optimized lux illuminance and DLA.

Keywords: Well Index, Reflectance, Atrium structure, Daylight autonomy, Atrium, Vertical daylight.

1. Introduction

Daylight has a prominent role in various human biological and psychological affairs, as it resets our biological clocks each day [1-6]. A major part of a sustainable and environmental architecture outlook is an atrium that can use daylight as a controlling scheme and bring down energy ~~dropping~~ drop [7]. As ~~a consequence~~such, the atrium ~~plays~~ has been playing a fundamental function in bringing daylight in our buildings over the past three decades [8].

There are various parameters for daylight optimization in the atrium ~~that are~~ indicated in a previous study for daylight optimization through architectural aspects in an office building atrium