

## Abstract

This research investigates the design of clearstories for atriums in tropical buildings. In the preliminary study, the appropriate forms and heights of the clearstories were determined based on the average illuminance and uniformity of daylight on the working planes, that meet the standard set by IES and CIE. The clearstories with continuous glazing on all four sides of the atrium were chosen, then the external shading devices were applied to decrease the effects of direct sunlight while giving sufficiency daylight and increasing uniformity.

This research is an experimental study with computer simulations using the lighting software "Dialux 4.4". Its accuracy has been verified by comparing the light intensity that the software generated with the actual measurements taken in a real atrium. The based-case atrium used in this study is a four-sided atrium (24 meters wide by 24 meters long and 17 meters tall) with clearstories on all sides. The reflectance of floors, walls, and ceilings inside the atrium space is 30%, 50%, and 80% respectively.

Results from the simulations show that clearstories with the height of 1.80 meters are the most suitable to provide the sufficient daylight as they provide the average minimum illuminance on the waiting area or indoor circulation higher than 100 lux and the average uniformity higher than 0.5 which is an acceptable value. Compared among three - sky conditions in terms of preventing direct sunlight and providing maximum daylight intensity, the most efficient option of shading devices application together with the clearstories are case 3 (louvered overhang), case 1 (overhang), case 4 (louvered), case 2 (double overhang), and case 5 (multiple louvered), respectively. In addition, the use of the clearstories and the shading devices decrease the effects of direct sunlight and increase average uniformity about 14.40% when compared with none shading devices case while admitting sufficient daylight for working.

In terms of heat gain, the calculated result of cooling load shows that using all type of shading devices together with the clearstories decrease an average cooling

load by 28.61 – 32.33 kBtu/hr. The most efficient options are case 3, case 1, case 4, case 2, and case 5, respectively.

This study give of clearstories design guidelines for atriums in tropical buildings in order to achieve maximum use of daylight, while minimizing heat gain from direct sunlight.