Opening a new window on daylight

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A new approach to windows that could let in more light and cut indoor lighting needs by up to 99% in buildings in Tropical regions without losing the cooling effect of shades. Details are reported in the *International Journal of Engineering Systems Modelling and Simulation* this month.

Lerdlekha Tanachaikhan and colleagues in the School of Environment, Resources and Development, at the Asian Institute of Technology in Pathumtani, Thailand, explain that electric lighting is typically responsible for 25 to 40% of total electricity consumption in air-conditioned buildings. These figures could be reduced significantly they say if daylighting were used instead.

In Tropical regions, however, daylighting leads to a significant rise in temperature, which has to be countered by air-conditioning if the occupants are to remain cool and comfortable. This in turn consumes about 80% of the total electricity consumption for the building.

Earlier studies on daylighting in buildings indicate that window designs and positioning are as diverse as buildings themselves and none currently provides a satisfactory answer to saving on the lighting bills without pumping up the air-conditioning.

The team has developed a formula for tropical sky climate conditions that allows them to assess different window configurations for daylighting. The formula takes into account glass type, solar and visible light transmittance and reflectance, shading coefficient and the heat insulation value, U.

The formula shows that for a city, such as Bangkok, the potential for daylighting is high and could cut daytime electric lighting requirements significantly. The team suggests that for more than 95% of the occupancy period of a typical office building, daylight alone would suffice for lighting with the appropriate window configuration.

This saving would not be reduced significantly even with the use of vertical fins for east-facing windows and horizontal canopies for south-facing windows to reduce heating effects. Daylighting and shading effects can be optimized by following their formula and choosing appropriate windows size and positioning as well as other parameters, such as glazing transmittance.

More information: "Daylighting for energy conservation in the tropics: a study on the influences of window configurations and shading devices" in *International Journal of Engineering Systems Modelling and Simulation*, 2009, 1, 144-159

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