

Study on Natural Light Distribution Inside the Room by Using Sudare as an Outside Horizontal Blind in Tropical Country of Indonesia

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Abstract : In tropical country like Indonesia, especially in Jakarta, most of the energy consumption on building is for the cooling system, the second one is from lighting electric consumption. One of the passive design strategy that can be done is optimizing the use of natural light from the sun. In this area, natural light is always available almost every day around the year. Natural light have many effect on building. It can reduce the need of electrical lighting but also increase the external load. Another thing that have to be considered in the use of natural light is the visual comfort from occupant inside the room. To optimize the effectiveness of natural light need some modification of façade design. By using external shading device, it can minimize the external load that introduces into the room, especially from direct solar radiation which is the 80 % of the external energy load that introduces into the building. It also can control the distribution of natural light inside the room and minimize glare in the perimeter zone of the room. One of the horizontal blind that can be used for that purpose is Sudare. It is traditional Japanese blind that have been used long time in Japanese traditional house especially in summer. In its original function, Sudare is used to prevent direct solar radiation but still introducing natural ventilation. It has some physical characteristics that can be utilize to optimize the effectiveness of natural light. In this research, different scale of Sudare will be simulated using EnergyPlus and DAYSIM simulation software. EnergyPlus is a whole building energy simulation program to model both energy consumption—for heating, cooling, ventilation, lighting, and plug and process loads—and water use in buildings, while DAYSIM is a validated, RADIANCE-based daylighting analysis software that models the annual amount of daylight in and around buildings. The modelling will be done in Ladybug and Honeybee plugin. These are two open source plugins for Grasshopper and Rhinoceros 3D that help explore and evaluate environmental performance which will directly be connected to EnergyPlus and DAYSIM engines. Using the same model will maintain the consistency of the same geometry used both in EnergyPlus and DAYSIM. The aims of this research is to find the best configuration of façade design which can reduce the external load from the outside of the building to minimize the need of energy for cooling system but maintain the natural light distribution inside the room to maximize the visual comfort for occupant and minimize the need of electrical energy consumption.

Keywords : façade, natural light, blind, energy

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