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by

Aviruch Bhatia, Sai Abhilash Reddy Sangireddy, Vishal Garg

in

Journal of Building Engineering

Report No: IIIT/TR/2019/-1

Centre for IT in Building Science
International Institute of Information Technology
Hyderabad - 500 032, INDIA
August 2019

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International Institute of Information Technology – Hyderabad, Hyderabad, India.

Abstract

In tropical climates, glass windows are important for a building's energy efficiency. By providing shading on a glass window, direct solar incident radiation can be restricted. This lowers the cooling energy consumption in buildings. The most commonly used method to provide shading is by using fixed shades such as overhangs and fins. Another method is to provide dynamic shades that can be controlled based on incident solar radiation on the façade. Shading is a method to control the solar heat gain coefficient (SHGC) and visible light transmission (VLT) of a vertical fenestration. This study is performed to obtain the equivalent SHGC of vertical fenestration with fixed and dynamic shading. Prescriptive requirements of energy codes, such as ASHRAE 90.1 and ECBC-India, limit the maximum SHGC value of fenestration. The effective SHGC with fixed shading is defined as the equivalent SHGC. The energy codes define tabular methods for the calculation of the equivalent SHGC that is generally given as a function of overhangs/fins depth, glass orientation, and latitude of the building. This tabular method generally does not cover all orientations, shading depths, and locations. Further, the equivalent SHGC for dynamic shade is either not defined in most of the codes or regarded as the minimum SHGC of the fenestration system. Herein, a simulation-based approach is proposed to calculate the equivalent SHGC for fixed and dynamic shades. A tool has been developed that uses EnergyPlus, the weather file of the building location, window and shading dimensions, and set point for dynamic shades, to perform parametric energy simulations to calculate the equivalent SHGC.

Paper Link https://www.sciencedirect.com/science/article/pii/S2352710218303930