

Application of Electrochromic Glazing for Reducing Peak Cooling Loads

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Abstract : HVAC equipment capacity has a direct impact on occupant comfort and energy consumption of a building. Glazing gains, especially in buildings with high window area, can be a significant contributor to the total peak load on the HVAC system, leading to over-sized systems that mostly operate at poor part load efficiency. In addition, radiant temperature, which largely drives occupant comfort in glazed perimeter zones, is often not effectively controlled despite the HVAC being designed to meet the air temperature set-point. This is due to short wave solar radiation transmitted through windows, that is not sensed by the thermostat until much later when the thermal mass in the room releases the absorbed solar heat to the indoor air. The implication of this phenomenon is increased cooling energy despite poor occupant comfort. EC glazing can significantly eliminate direct solar transmission through windows, reducing both the space cooling loads for the building and improving comfort for occupants near glazing. This paper will review the exact mechanism of how EC glazing would reduce the peak load under design day conditions, leading to reduced cooling capacity vs regular high-performance glazing. Since glazing heat transfer only affects the sensible load, system sizing will be evaluated both with and without the availability of a DOAS to isolate the downsizing potential of the primary cooling equipment when outdoor air is conditioned separately. Given the dynamic nature of glazing gains due to the sun's movement, effective peak load mitigation with EC requires an automated control system that can predict solar movement and radiation levels so that the right tint state with the appropriate SHGC is utilized at any given time for a given façade orientation. Such an automated EC product will be evaluated for a prototype commercial office model situated in four distinct climate zones.

Keywords : electrochromic glazing, peak sizing, thermal comfort, glazing load

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