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Study on the Impact of Windows Location on Occupancy Thermal Comfort by Computational Fluid Dynamics (CFD) Simulation

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Abstract : Natural ventilation strategies continue to be a key alternative to costly mechanical ventilation systems, especially in healthcare facilities, due to increasing energy issues in developing countries, including Bangladesh. Besides, overcrowding and insufficient ventilation strategies remain significant causes of thermal discomfort and hospital infection in Bangladesh. With the proper location of inlet and outlet windows, uniform flow is possible in the occupancy area to achieve thermal comfort. It also determines the airflow pattern of the ward that decreases the movement of the contaminated air. This paper aims to establish a relationship between the location of the windows and the thermal comfort of the occupants in a naturally ventilated hospital ward. It defines the openings and ventilation variables that are interrelated in a way that enhances or limits the health and thermal comfort of occupants. The study conducts a full-scale experiment in one of the naturally ventilated wards in a primary health care hospital in Manikganj, Dhaka. CFD simulation is used to explore the performance of various opening positions in ventilation efficiency and thermal comfort in the study area. The results indicate that the opening located in the hospital ward has a significant impact on the thermal comfort of the occupants and the airflow pattern inside the ward. The findings can contribute to design the naturally ventilated hospital wards by identifying and predicting future solutions when it comes to relationships with the occupants' thermal comforts.

Keywords : CFD simulation, hospital ward, natural ventilation, thermal comfort, window location
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