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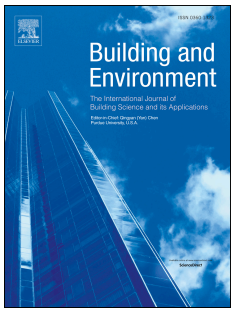

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Experimental study on airflow characteristics with asymmetrical heat load distribution and low-momentum diffuse ceiling ventilation

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Abstract

Airflow characteristics were studied with asymmetrically distributed heat load and diffuse ceiling ventilation. The heat load was gradually increased from 40 to 80 W/floor-m^2 while the target temperature of exhaust air was kept at 26±0.5°C. Experiments were carried out in a test room by conducting measurements with omnidirectional anemometers, data loggers and marker-smoke visualizations. The heat load consisted of two opposite workstations next to heated window panels in the perimeter area. The other side of the room was an open area describing a corridor zone. The workstation had a seated test dummy with laptop and monitor. The results indicate that asymmetrical heat load distribution creates a large-scale circulating airflow pattern from the heat sources to the opposite side of the room. Furthermore, the mean air speed and the airflow fluctuation increased with heat load and supply airflow rate. Consequently, also the turbulent kinetic energy and the turbulence dissipation increased. However, heat load had only a small effect on the turbulence intensity and the fluctuation energy ratio. Therefore, draught rate increased significantly with mean air speed. The observed results agree mainly with the symmetrical results otherwise, except for the systematic large-scale circulation that was not found in the symmetrical test case. The maximum draught rate was 18-21 % indicating the category B-C of thermal