

Experimental Investigations on Effects of Student Occupancy Rate in a Student Hostel Room on Indoor Air Quality

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ABSTRACT

Ventilation requirement of student hostel rooms is often neglected despite their severe implications on indoor air quality (IAQ). The hostel rooms often house multiple students and depend solely (to limit noise and insects) on air infiltration for ventilation needs. Limited induction of fresh air through natural ventilation increases susceptibility to CO₂ buildup to the warning limits. In the current work, the temporal evolution CO₂ concentration in a standard hostel room has been investigated experimentally. A set of experiments, each for a duration of 4 to 6 hours with constant environmental conditions, were conducted with occupants as the only source of CO₂ generation to study the effect of varying occupancy levels. The CO₂ concentration rapidly increases in the beginning, then levels off at an almost constant value. The steady-state value of the CO₂ increases with an increase in student occupancy, exceeding the recommended threshold value to avoid Sick Building Syndrome (SBS). Theoretical models were used to test and analyse the buildup of CO₂ by extracting important ventilation parameters such as the Air Change per Hour (ACH) and steady-state CO₂ concentration. These models were validated in parallel to experimental data obtained under controlled ventilation conditions. The results reflected the importance of maintaining adequate ventilation proportional to the number of occupants.

Keywords: Indoor Air Quality, CO₂ accumulation, ventilation, Sick Building Syndrome, Air Change per Hour