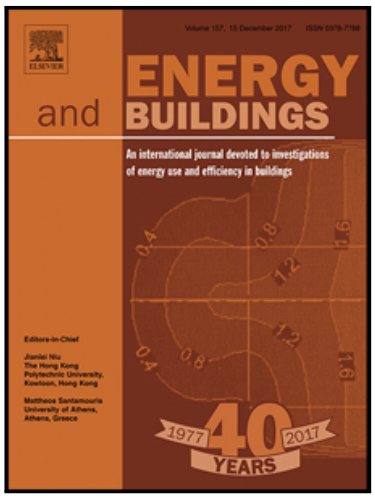

Performance of a natural ventilation system with heat recovery in UK classrooms: An experimental study

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Performance of a natural ventilation system with heat recovery in UK classrooms: An experimental study

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Abstract

This paper presents the ventilation performance of a Passive Ventilation System with Heat Recovery (PVHR) based on *in-situ* monitoring in a primary school in London. The study involves long-term (15-month) monitoring of temperature, relative humidity and Carbon dioxide (CO_2) concentrations in both the classrooms and the outdoor environment. In addition, short term (1&2 week) observational monitoring was performed in two classrooms at ventilation system level and classroom level, during both the heating and non-heating seasons. Temperatures and air velocities were measured within the PVHR system while instances of window opening and the number of students were noted in daily diaries. Air permeability and infiltration measurements were performed to characterise the spaces. Time-varying ventilation rates were estimated through a form of continuity equation considering CO_2 generation rates by occupants. Preliminary results show that the operation of the ventilation system is more sensitive to changes in wind speed and direction than to buoyancy. When negative pressure was observed on the classrooms' facades the ventilation system was supplying two to three times more air in comparison to instances when positive pressures were observed. The assessment of the ventilation performance of such natural ventilation systems depending solely on wind and buoyancy is complicated as they are dynamic systems that constantly balancing with the surrounding conditions, and the operation is highly correlated to the airtightness of the building's envelope.

Keywords: Natural ventilation; Indoor Air Quality (IAQ); Air tightness; Schools

Highlights:

- CO_2 concentrations in classrooms with passive ventilation systems (PVHR) were satisfactory
- Airtightness significantly affects the performance of the passive ventilation system
- Passive ventilation system appears more sensitive to wind changes than to buoyancy