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Demand Controlled Ventilation in an Auditorium

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ABSTRACT

Demand Controlled Ventilation in an Auditorium

In conjunction with IEA Annex 18, DCV-systems, a test on an auditorium in a school in Tyreso south of Stockholm has been carried out.

The auditorium has 450 seats on a slightly sloped floor and a ventilation system with low impulse air supply devices placed at the lower (front) part of the auditorium. The system is intended to act as a displacement ventilation system during operation with heat load from people. The flow rate is governed by a CO₂ sensor in the exhaust air device. In non-operational state, and if heating is necessary, the system operated with recirculation of air. The system is provided with a cyclic heat exchanger for heat recovery from the exhaust air.

The air flow rate is kept at a low level during non-operational times. On increasing load from persons the CO₂ sensor causes a change from recirculation to ventilation with 100% outdoor air. If the CO₂ concentration rises, the air flow rate is increased by changing the speed of the fans. When occupied the auditorium ventilation system gives an increased air flow rate that should be proportional to the increase of CO₂ content in the room air. In most cases however the system flow rate rises to the maximum level. It thus acts as a two-level governing system. The reason for this is the difficulty in finding a proportional band and delay times for system speed changes so that the outdoor air supply will not be too low for keeping the CO₂ level down as high people load.

The CO₂ concentration has been monitored at the exhaust air device, which is situated at the back wall of the auditorium. Concentration levels are well in coincidence with theoretically calculated values.

Temperature gradients have been measured by using sensors placed at four different levels.

The contents of volatile pollutants in the room air have been measured with a new hand-carried device. Moistening the floor and the seats was found to rapidly increase VOC's.