#4909

An Energy Efficient Ventilation Method for a Kindergarten

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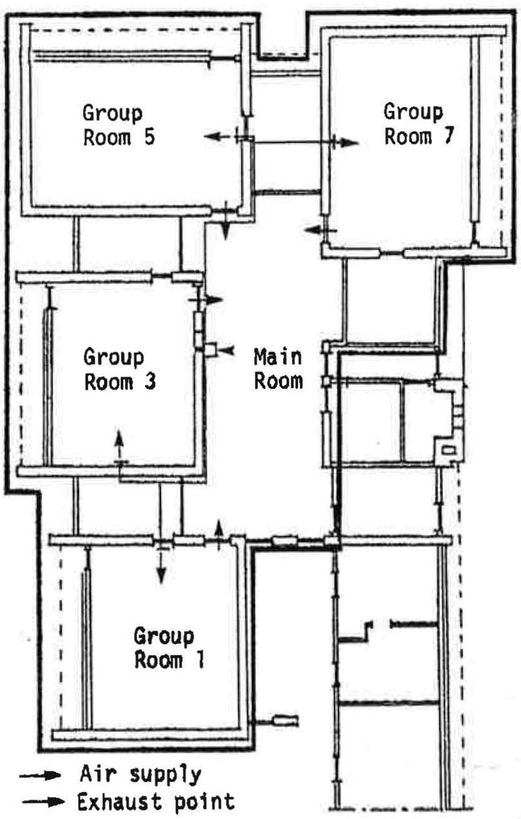
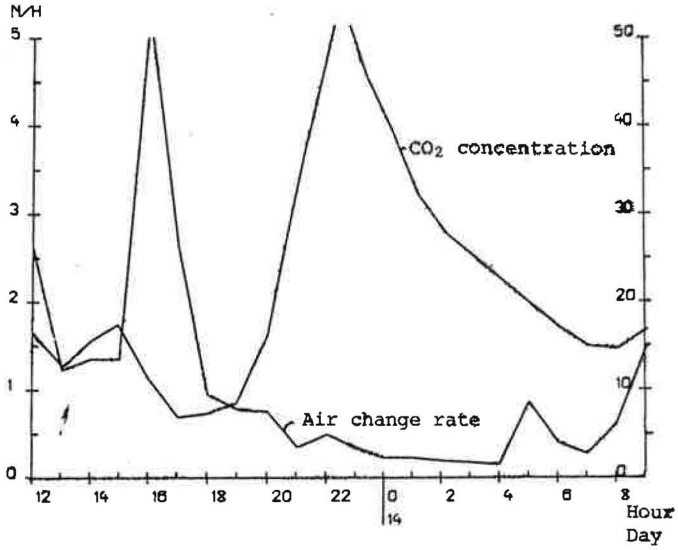
In the last edition of Air Infiltration Review*, we presented our constant concentration tracer gas instrumentation (which actually was the first constant concentration instrument to be used in occupied buildings). We developed this instrument mostly to solve problems of indoor climate in existing buildings and to review the ventilation strategies in the retrofitting of old buildings and in the planning of new buildings.

We are presently working on problems associated with kindergartens which, with regard to indoor climate, are quite overpopulated. Typically, the kindergartens are around 300 m^2 in area and 700–1,000 m^3 in volume, with 60–80 children, and with natural ventilation only. The basic air change rate is 0.2–0.4 ach. As we have shown*, users have a tremendous impact on air infiltration which, in the kindergartens, rises from the basic 0.2–0.4 to 0.7–1.5 ach when the kindergarten is in use.

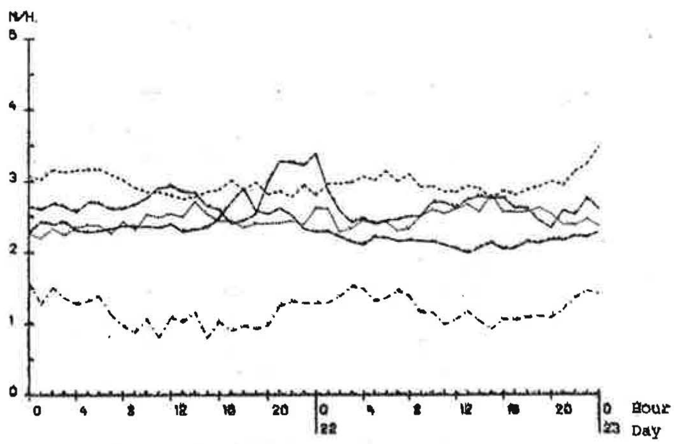
With a 100 day outdoor temperature profile averaging 0°C and temperatures easily going down to −10°C to −20°C, it is impossible to achieve the necessary air change rate of 1.5–2.5 ach in these periods without installing some sort of mechanical ventilation system. In a kindergarten, the normal retrofitting of a mechanical ventilation system with a capacity of 2–3 ach will cost an average of £15–20,000. This generally exceeds the amount of money the local authorities can afford and therefore we have looked at a different approach to the problem.



As shown in Figure 1, we aim to have the air supply inlet in the group rooms (1, 3, 5 and 7) and the exhaust in the main room (9). The philosophy is that the children would be in either the group room using the fresh air there or in the main room using the fresh air coming from the group room not in use. In this way we reduce the ach by 50% without really having any drawbacks, as well as reducing the noise levels and size of ventilation equipment. Thus the cost is reduced to around £4,000 or to 20–30% of the cost of the normal system.



In Figure 2 we have shown a typical output of a measurement of ach and CO_2 concentration in an occupied kindergarten with natural ventilation.



	Measured		Nominal	
Room 9	(180) 1000	m^3/h	1000 m^3/h	exhaust
Room 7	280	m^3/h	250 m^3/h	inlet
Room 5	250	m^3/h	250 m^3/h	inlet
Room 3	250	m^3/h	250 m^3/h	inlet
Room 1	220	m^3/h	250 m^3/h	inlet

Figure 3 shows the measured ach resulting from the application of the new concept.

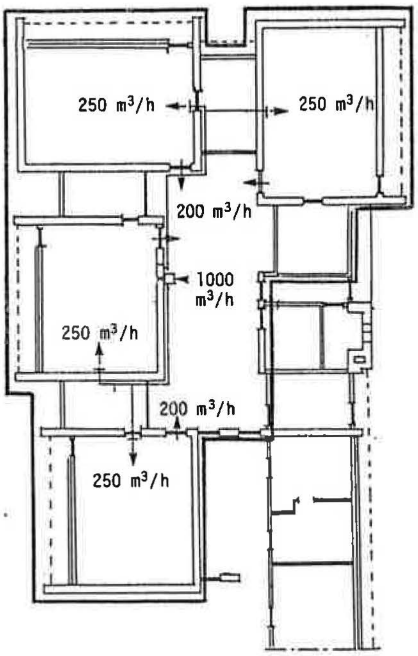
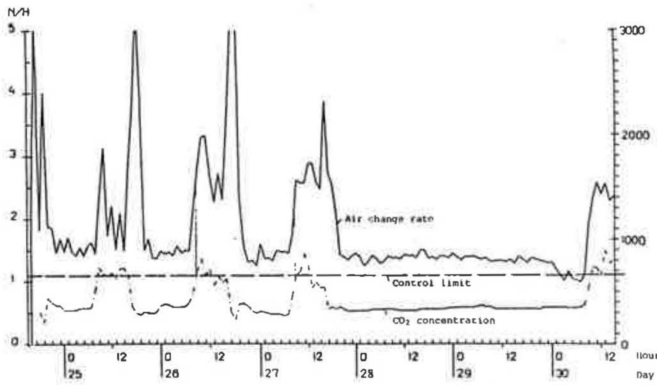


Figure 4 shows the air flow rates through the building. Some of these were measured, others a qualified guess.

Finally, we have installed a CO_2 concentration based regulating device for the ventilation system alternating in two steps from one third to full operation. Figure 5 shows the corresponding ach and CO_2 concentration recordings.



Future work on this project will be to evaluate the air flow rates, the use of CO_2 based regulation and the cost-benefit of the system.

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IEA Workshop: Condensation Problems – A Search for an International Strategy

23–25 September 1985
Leuven, Belgium

The executive committee of the IEA Energy Conservation in Building and Community Systems sponsored this recent workshop to discuss surface condensation and mould growth in buildings. This followed widespread concern that remedial measures in existing buildings, aimed at conserving energy demand, as well as poorly designed energy efficient new buildings, were the cause of serious moisture problems in buildings. The objective of the meeting was to explore the reasons for condensation and the growth of mould in buildings, with particular reference to building design, construction methods and occupant behaviour, with a view to devising a plan for joint research. The workshop itself was jointly organised by the Prime Minister's Science Publicity Office, Belgium and the Laboratory of Building Physics of the Catholic University of Leuven.

The meeting began with a series of presentations illustrating the magnitude of the mould growth and condensation problem as it affected the ten IEA countries represented at the workshop. Moisture production by the activities of occupants coupled with inadequately designed means of ventilation and poor thermal integrity of building materials were evident causes of the problem. Possible remedial actions covered improved levels of insulation, the use of extractor fans, increased internal temperatures, dehumidification and the education of occupants.

The papers presented varied from detailed theoretical studies of the occurrence of condensation and mould growth to contributions from those directly concerned with the day-to-day problems of condensation in high risk buildings.

Areas for future research identified at the meeting included the need to:

- develop a reliable hygro-thermal building model from which simplified models could be produced
- carry out measurements for model validation
- investigate the influence of different parameters on moisture balance
- obtain an insight into the potential relationship between energy conservation and moisture in buildings.

A draft strategy for international task-sharing research was prepared for presentation to the IEA executive committee. The items for consideration included:

- a need to analyse the mechanisms of mould growth in detail. In addition, the common species of mould should be identified and their optimum environment for growth determined
- an analysis of existing data relating to both the thermal and the hygroscopic properties of common building materials. Particular needs include thermal conductivity, moisture content of materials (as a function of relative humidity), diffusivity and vapour transfer coefficients