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IMPROVING INDOOR AIR QUALITY OF NATURALLY VENTILATED CLASSROOMS IN THE NORTHEAST OF PORTUGAL

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Abstract

This article addresses CO₂ dynamics in school classrooms and analyses the improvement of ventilation and indoor air quality resulting from the simple window-opening ventilation strategies. CO₂, temperature and relative humidity were measured in four different naturally ventilated classrooms of a Northeastern Portuguese education institution for a wide range of environmental conditions. Indoor CO₂ levels were also simulated with a numerical model to help manage the indoor air quality of these spaces through scenario analysis. The results stressed that the occupants were potentially exposed to uncomfortable and unhealthy indoor air quality conditions, since ventilation occurs primarily through infiltration. Under low ventilation conditions, CO₂ concentrations easily exceeded the standard of 1250 ppm, even for occupation rates lower than 50%. To provide healthy indoor air to the occupants, acceptable and affordable ventilation rates can be assured by opening at least a small window for a few minutes over the typical 60 minute class period or during class breaks. For occupation rates close to the nominal capacity of classrooms, longer periods and larger opening areas are required to reduce the discomfort and health risks from potential exposure to indoor air pollutants.

Key words: air exchange rate, carbon dioxide, measurement, modelling, school

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