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CFD investigation of indoor hygrothermal and airflow profile in academic research storage room: Effect of lma on thermohygric balance and mould growth (Article)

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Abstract

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Ventilation systems maintain thermal comfort and indoor air quality for the building envelopes, occupants and furnishings. The systems often perform in opposite to the design intents despite its high energy outlay. Hence, the need to provide energy efficient buildings without compromising the design purposes had produced various ventilation performance metrics. This study investigates the effect of Local Mean Age (LMA) of air on indoor thermal and hygric balance as well as mould growth. In-situ experiments were combined with computational fluid dynamics (CFD) simulation to assess the indoor hygrothermal and the airflow profile in a mechanically ventilated research store with known history of mould growth. A commercial CFD analysis with the standard k-s model was used in the CFD simulation. The measurement and validation of the model are reported in a companion paper. The study found that hygrothermal profiles in the stacks depends on airflow field. In most cases, high hygric profile is synonymous with elevated LMA. The poorest locations in LMA shown highest thermohygric balance and visible mould growth on the stored items. The findings suggest that LMA has a significant effect on hygrothermal stratifications as well as indoor mould growth risk.

Author keywords

CFD simulation Indoor air quality Local mean age Mould growth risk Thermohygric balance

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