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## An experimental study of the flow induced by the motion of a hinged door separating two rooms

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### Abstract

The indoor air flow and mass exchange induced by the rotating motion of a hinged door separating two rooms is investigated. Experiments were conducted in a scale model based on Reynolds number matching. Flow visualisations show the transport mechanism associated with the open and close phases of the door motion. In the room into which the door is opened a large-scale vortex is formed during opening, which is advected along the walls. In the adjacent room, a volume of fluid spreads both longitudinally and transversely. Concentration measurements were carried out to quantify the mass exchange generated by these flow patterns. Results are presented in dimensionless form for the volume of fluid exchanged and are compared to earlier data. The effects of hold open time and door speed on the exchanged fluid volume are investigated. The exchange volume increases with hold open time, but it does not vary considerably with door speed for a constant hold open time. Further, three-dimensional velocity measurements were carried out near the doorway and the characteristics of the velocity field developed are also presented.

**Keywords:** indoor airflow, door motion, mass exchange, flow visualisation

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