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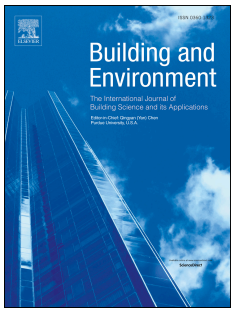

An experimental study of the flow induced by the motion of a hinged door separating two rooms

Ilias G. Papakonstantis, Elizabeth Abigail Hathway, Wernher Brevis

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

Ilias G. Papakonstantis[*,a], Elizabeth Abigail Hathway, Wernher Brevis[b]

Department of Civil and Structural Engineering, University of Sheffield, Sir Frederick Mappin Building, Mappin Street, Sheffield S1 3JD, UK.

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

[*] Corresponding author. Email address: ipapak@mail.ntua.gr

[a] Present address: *Department of Water Resources and Environmental Engineering, School of Civil Engineering, National Technical University of Athens, 5 Heroon Polytechniou Str, 15780 Zografou, Greece.*

[b] Present address*: Department of Hydraulics and Environmental Engineering / Mining Engineering, School of Engineering, Pontifical Catholic University of Chile, Vicuna Mackena 4860, Macul, Santiago, Chile.*