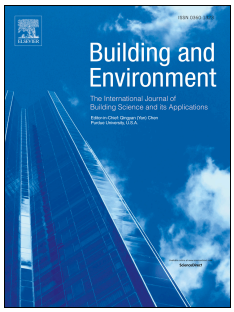
Accepted Manuscript



Improvement of the momentum method as the diffuser boundary condition in CFD simulation of indoor airflow: Discretization viewpoint

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PII: S0360-1323(18)30316-0

DOI: 10.1016/j.buildenv.2018.05.050

Reference: BAE 5488

To appear in: *Building and Environment*

Received Date: 16 April 2018

Revised Date: 24 May 2018

Accepted Date: 26 May 2018

Please cite this article as: Deng B, Wang J, Tang J, Gao J, Improvement of the momentum method as the diffuser boundary condition in CFD simulation of indoor airflow: Discretization viewpoint, *Building and Environment* (2018), doi: 10.1016/j.buildenv.2018.05.050.

Improvement of the Momentum Method as the Diffuser Boundary Condition in CFD Simulation of Indoor Airflow: Discretization Viewpoint

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Abstract: The momentum method was considered to be not applicable for a fine grid adjacent to the diffuser. However, the reason underlying this phenomenon has not been clarified until now. This paper explains this issue from the viewpoint of discretization. The momentum equation is integrated in the first cell adjacent to the diffuser and is expressed as the diffuser-related term and the diffuser nonrelated term. The direct momentum method and the convective-flux momentum method use different diffuser-related terms. A large error may be introduced for the convective-flux momentum method when the first grid interval adjacent to the diffuser is very small. The total-flux momentum method is presented to include both the convective flux and the diffusion flux in the momentum source. Good agreement between the total-flux momentum method and experiment is obtained. The total-flux momentum method helps to minimize the computational error and facilitates the determination of an optimal grid.

Keywords: diffuser boundary condition; CFD; momentum source; diffusion flux.

1. Introduction

Diffusers introduce fresh air into the indoor environment. It is crucial to describe