

CFD Analysis of a Two-Sided Windcatcher Inlet/Outlet Ducts' Height in Ventilation Flow through a Three Dimensional Room

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Abstract : A windcatcher is a structure fitted on the roof of a building for providing natural ventilation by using wind power; it exhausts the inside stale air to the outside and supplies the outside fresh air into the interior space of the building working by pressure difference between outside and inside of the building and using ventilation principles of passive stacks and wind tower, respectively. In this paper, the effect of different heights of inlet/outlets' ducts of a two-sided windcatcher on the flow rate, flow velocity and flow pattern through a three-dimensional room fitted with the windcatcher are investigated and analysed by using RANS CFD technique and applying standard K- ϵ turbulence model via a commercial computational fluid dynamics (CFD) software package. The achieved results show that the inlet/outlet ducts height strongly affects flow rate, flow velocity and flow pattern especially in the living area of the room when the wind velocity is not too low. The results are confirmed by the experimental test for constructed scaled model in the laboratory and it develops the two-sided windcatcher's performance in ventilation applications.

Keywords : CFD, RANS, ventilation, windcatcher

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