

# Investigation of Opening Position on Natural Cross Ventilation for an Isolated Building



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**Abstract** The opening position is one of the factors that affect the ventilation performance of a building. In this study, the effect of opening position on natural cross ventilation of isolated building was investigated. The airflow pattern and ventilation rate under different opening configurations were analyzed. Eight different opening configurations were considered, including aligned and unaligned openings, as well as vertical-opening design. Computational fluid dynamics (CFD) simulation with 3D steady-state RANS equation Shear Stress Transport (SST)  $k-\omega$  turbulence model was used. The parameters of streamwise dimensionless wind speed ratio ( $U/U_{ref}$ ), pressure coefficient ( $C_p$ ) and dimensionless flow rate (DFR) were analyzed in this study. The results show that the aligned opening configuration Top-Top has the highest DFR at 0.60. This result is similar to that obtained from the literature. In addition, the design of vertical openings can improve the DFR of the building. The DFR of the building is mainly affected by the position of the opening on the windward side. This concludes that the opening positions exert an imperative role in affecting the internal airflow pattern, air recirculation and DFR of a naturally cross ventilated building.

**Keywords** Natural cross ventilation · Opening position · CFD · Vertical opening

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