

The Role of Semi Open Spaces on Exploitation of Wind-Driven Ventilation

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Abstract : Given that HVAC systems are the main sources of carbon dioxide producers, developing ways to reduce dependence on these systems and making use of natural resources is too important to achieve environmentally friendly buildings. A major part of building potential in terms of using natural energy resources depends on its physical features. So architectural decisions at the first step of the design process can influence the building's energy efficiency significantly. Implementation of semi-open spaces into solid apartment blocks inspired by the concept of courtyard in ancient buildings as a passive cooling strategy is currently enjoying great popularity. However, the analysis of these features and their effect on wind behavior at initial design steps is a difficult task for architects. The main objective of this research was to investigate the influence of semi-open to closed space ratio on airflow patterns in and around midrise buildings and introduce the best ratio in terms of harnessing natural ventilation. The main strategy of this paper was semi-experimental, and the research methodology was descriptive statistics. At the first step, by changing the terrace area, 6 models with various open to closed space ratios were created. These forms were then transferred to CFD software to calculate the primary indicators of natural ventilation potentials such as wind force coefficient, air flow rate, age of air distribution, etc. Investigations indicated that modifying the terrace area and, in other words, the open to closed space ratio influenced the wind force coefficient, airflow rate, and age of air distribution.

Keywords : natural ventilation, wind, midrise, open space, energy

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