UNIVERSITI TEKNOLOGI MARA

NUMERICAL INVESTIGATION ON THE EFFECT OF BUILDING OVERHANG ON THE FLOW WITHIN IDEALIZED TWO-DIMENSIONAL STREET CANYON

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of the requirements for the degree of
Master of Science
(Mechanical Engineering)

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research

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ABSTRACT

The purpose of overhang is to protect the pedestrian from a specific weather such as heavy rain and sunlight heat, which however conflicts with the previous studies on the effect of the overhang to the air quality within the canyon. Thus, the aim of this research is to investigate the influence of buildings overhang on the airflow and pollutant dispersion in the street canyon. The flow pattern and the pollutant concentration were evaluated by set up the overhang on the two types of typical building geometries namely flat roof and pitched roofs. This paper reported the results of the velocity flow field in a two-dimensional street canyon with different building overhang configuration using a computational fluid dynamics (CFD) by employing Reynolds Average Navier Stokes (RANS) approach. Simulation was conducted with a constant aspect ratio of W/H = 1, where W is the street width and H is the building height. A total of twelve cases of flat roof and pitched roof with no overhang, overhang on both sides, or overhang on either the leeward or windward side were simulated in order to get the understanding on the flow behaviour. The result shows that for the case of flat roof building, the pollutant concentration is higher on the windward side than on leeward side except for the case of 0.5HW as the counter-rotating vortex occur inside the canyon. On the contrary, the pollutant concentration is higher on the windward side for the case of pitched roof except for the case of pitched roof buildings with no overhang. The ratio of the canyon opening to the building height for some cases with a long overhang can be classified as a deep canyon and the flow regime are categorized as a skimming flow. Thus, in this study the case without overhang performs a better ventilation as the flow from the outer layer can penetrate well into the street canyon.

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