Abstracts

Although elevated highways can solve many traffic problems, they, at the same time, can lead to other problems. One of which is the accumulation of pollution emitted from motor vehicles' engines, underneath these elevated highways. The concern is particularly on carbon monoxide (CO), a fatal toxic. The accumulation of carbon monoxide occured basically because elevated highways act as umbrellas, which collect traffic pollutions underneath. Therefore, it is clear that, without proper ventilation, these pollutions can also be drawn to buildings surrounded. Indoor air quality problems follow, as a result. It is foreseen that having a good physical environment for effective ventilation is an important design solution to the control of carbon monoxide level underneath the elevated highways to recommended safety threshold.

The research includes a study of the groups of factors affecting the accumulation of carbon monoxide underneath elevated highways. It has been started from collecting needed information and standards of carbon monoxide including carbon monoxide level generated from traffic, and carbon monoxide concentration found in an ambient air. Both are regarded as the first and most important group of factors to the accumulation. The second group of factors affecting the scatter of pollutions, including carbon monoxide; incorporates wind velocity and direction. The third group of factors is a set of building's surroundings and characteristics, which are the height of concerning elevated highways, the density of physical surroundings, height of the building itself, setbacks from street, and building's shape. The performance indicator of ventilation efficiency is carbon monoxide concentration underneath the elevated highways. This research was studied by using Computational Fluid Dynamics (CFD) software. There are two stages of experiments. The first is the comparison of factors; elevated highway height, surrounded building density, building's setback and building's height; to ventilation effectiveness. The second stage is finding the ideal building shape for pollution dilution, by using the results found as worst-case scenarios from the first stage

It was found that the most effective factors are building's setbacks, building's height, elevated highway height, and surrounded buildings density, respectively. As for the

shape of buildings, it is shown that the L-shape provides better ventilation than the square. Moreover, buildings with smaller footprint are superior over the large ones, in terms of ventilation effectiveness. Additionally, it is recommended that the narrow side of a building be laid parallel to the street, so as to decrease the pollution accumulation. Although, both can be used as a combination for a synergetic effect, the shape plays more important role than the setbacks.

The research shows promising results which can be very valuable for setting up a guideline to design physical environment and building's characteristics. Moreover, a mathematical model was derived to predict carbon monoxide level underneath elevated highways. This will certainly be a great assistance to the design of a better environment pollution diluted as well as to carbon monoxide's health effect decreased.