Designing a model of affordable housing in high-rise building with a focus on the use of environmental factors in humid subtropical climate - roofing Rasht

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Abstract Tall buildings are more vulnerable to earthquake loads and wind loads than low buildings due to their high heights. Aerodynamic forms are aimed at solving the problem of optimizing the high-rise building forms in order to improve their structural stability against wind. The most basic measure to cope with the problem of wind turbulence effects is to weaken the wind, which can be accomplished by the use of techniques to design the building in aerodynamic form. The present study was carried out in several sections whose main goal was to optimize the form of high-rise buildings with aerodynamic techniques so as to reduce drag force. Also, we attempted to use designing techniques with aerodynamic modifications so as to reduce the wake region behind the tall building. To maintain the sustainability of the buildings, such issues as optimizing energy use and enhancing thermal conform were also considered. At the first phase of the study, an experimental test was conducted on a green wall in order to reduce heat waste. According to a fieldwork, a pilot case was studied in Esteqamat St. of Rasht, Iran. As per the research methodology, the temperature and humidity of the model Mic 98583 (with the specification of accuracy:temp. ±0.6 °C, 40.0°C~85.0°C & RH ±3%, 0.1~99.9% RH) were recorded with a data logger over a one-year period. The wind tunnel was numerically simulated with the Autodesk Flow Design 2014 software package (three-year student version). The results of the experiment on the green wall revealed that the green walls in humid subtropical climate can reduce heat waste by about 12% in winters and by about 27% in summers the outside environment to the inside of the building. Then, results of CFD simulation indicated that the model with chamfered triangular footprint could

reduce the length of the wake region by about 50% as compared to the base form. Finally, the aerodynamic modification technique of tapering can produce the most optimal form for reducing the drag force in order to alleviate the impact of the wind on 50-story high-rise buildings with the height of about 150 meters.

Keywords : Keywords: Affordable housing, Tall buildings, Environmental factors, Humid subtropical climate, Wind aerodynamic, Shape optimization, Bioclimatic design, Drag force, Green wall.