ABSTRACT

Underfloor Air-Conditioning (UFAC) system is generally perceived as a better performing air-conditioning system as compared to the conventional systems. However, not all of the advantages are verified in the field, particularly in a tropical climate. Calculated benefits include improved indoor air quality (IAQ), potentially higher ventilation efficiency and lower energy consumption.

In this dissertation, comparative studies between UFAC and conventional systems are made using IAQ and ventilation related energy to assess their performances. Conventional systems, in this context, comprise of Constant Air Volume (CAV) and Variable Air Volume (VAV) systems, and each system is represented by a building using it. IAQ is divided into objective and subjective parameters where the former presents results of actual field measurements and the latter reflects occupants’ perception of IAQ acceptability. Energy simulations are conducted on the buildings using DOE2.1E Program. They allow for validation with actual values to check for accuracy, after which ventilation related energy are extracted from space cool energy. Analysis of objective and subjective IAQ parameters with ventilation related energy are made among the systems.

In conclusion, UFAC proves to fare better than conventional systems; it records a lower objective pollutant index accompanied with lower ventilation related energy consumption as well. However, its subjective counterpart fares much worse than those of conventional systems. UFAC has performed well in field measurements, as well as in terms of energy consumption; however, occupants still seem unresponsive towards this newly implemented air-conditioning system.