

A Study on a Real Case Indoor Thermal Environment Installed with an Under-Floor Air Distribution System in the Tropics

Prepared by: Lai Chien Sin

ABSTRACT

In recent decades, the heating, ventilating, and air conditioning (HVAC) system has been introduced to the worldwide for air treatment in a closed room, office, and building. As a matter of fact, it holds a rather important role especially in multi-floors building to supply clean, fresh, and comfortable air to the occupants in the building. Convectional overhead (OH) air conditioning system is found getting eliminated from the industry due to high energy consumption, low ventilating efficiency, over cooling or heating. On the other hand, under-floor air distribution (UFAD) system is gaining more attention in the recent years due to its lower energy usage feature. TM Tower is believed as the first building which implemented UFAD system in Malaysia. However, according to some previous researches done, there is a need of improvement for the current UFAD design in order to adopt it in the tropics. In this paper, the impact of supply air temperature on the overall thermal comfort and energy consumption are studied. TRNSYS Simulation Software is used to investigate the effect of different supply air temperature on the conditioned space's thermal condition and compute the cooling load that accountable. Besides that, FloEFD acts a supporting tool in this project to provide a visual result for local mean age (LMA) of indoor air which indicates the air quality. ASHRAE Standard 55 and Standard 62 in HVAC system design are used as the guidelines throughout the project. It is revealed that as the supply air temperature increases, the overall indoor air temperature became higher, while the relative humidity became lower on the other hand. Also, the total cooling load of the system responds to the increasing supply air temperature in a proportional way. Supply air temperature of 20°C had seemed to be optimum value of providing acceptable thermal comfort and saving energy at the same time.