Environmental Engineering and Management Journal

November 2020, Vol.19, No. 11, 2059-2075
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

"Gheorghe Asachi" Technical University of Iasi, Romania

THERMAL COMFORT AND VENTILATION CONDITIONS IN HEALTHCARE FACILITIES - PART 2: IMPROVING INDOOR ENVIRONMENT QUALITY (IEQ) THROUGH VENTILATION RETROFITTING

Mawara Khan[1], Muhammad Jamaluddin Thaheem[2*], Musfira Khan[3], Ahsen Maqsoom[4], Muhammad Zeeshan[5]

[1]Department of Construction Engineering & Management, School of Civil and Environmental Engineering, National University of Sciences and Technology, Islamabad, Pakistan
[2]School of Architecture and Built Environment, Faculty of Science, Engineering & Built Environment, Deakin University, Geelong, Australia
[3]Department of Computer Science, School of Electrical Engineering and Computer Science, National University of Sciences and Technology, Islamabad, Pakistan
[4]Department of Civil Engineering, COMSATS University Islamabad, Wah Campus, Pakistan
[5]Institute of Environmental Sciences and Engineering, School of Civil and Environmental Engineering, National University of Sciences and Technology, Islamabad, Pakistan

Abstract

The basic purpose of a hospital is to provide a cure to the ailing patients. Since the patients are already suffering from ailments, the hospital must be a place for comfort and mental peace. Indoor Environmental Quality plays a vital role in maintaining that comfort. The hospital building must be designed on the standards to provide the required thermal comfort. If the building is already built and operational, retrofitting techniques are used to maintain the standard values of indoor environmental quality. In this study, three indoor environmental quality parameters (temperature, relative humidity, and CO_2) are identified after quantitative analysis. Each of the parameters correlates with ventilation rates of the selected location. Based on that relation, the required range of ventilation rates was calculated by simulation of equations, identified from the literature. AnyLogic7 was used for the modeling and simulation of the equations. For the required ventilation rates, retrofitting techniques providing optimum cost and efficiency were identified for each location. It was concluded that the existing indoor environmental quality of hospital buildings can be improved with suitable retrofitting techniques, which can increase the efficiency of the HVAC system, resulting in overall reduced energy consumption.

Keywords: AnyLogic7, hospital building ventilation, HVAC system, indoor air quality, retrofitting

Received: May, 2019; Revised final: May, 2020; Accepted: June, 2020; Published in final edited form: November, 2020

[*]Author to whom all correspondence should be addressed: e-mail: jamal.thaheem@deakin.edu.au, Phone: +61 3 522 73716