INI-C'S SIMPLIFIED THERMAL COMFORT ASSESSMENT METHOD: AN EVALUATION

ROBERTA VIEIRA GONÇALVES DE SOUZA, Dra. | UFMG – Universidade Federal de Minas Gerais
HELDER GATTONI MEDEIROS, MSc. | UFMG – Universidade Federal de Minas Gerais

1. INTRODUCTION

A building is considered more energy efficient than another when it provides the same condition of thermal comfort for the occupant, with lower energy consumption (LAMBERTS, 2014). In this sense, buildings with natural conditioning must prove that they reach thermal comfort conditions when they are not using mechanical air conditioning systems.

The need to implement measures to mitigate the electricity consumption of buildings in the country led to the creation of the RTQ-C in 2009. Although Brazil has many naturally ventilated buildings, the RTQ-C is strongly oriented towards buildings artificially air conditioned. In 2021, the Brazilian Government published an improvement to the RTQ-C, renaming it to INI-C which, among other changes, presents a simplified method for evaluating the percentage of hours in thermal comfort (PHOCt) for naturally ventilated spaces.

This work, then, aims to analyze the applicability and possible limitations of this method using buildings from the UFMG Pampulha Campus as a case study.

2. METHODOLOGY

The Pampulha Campus of the Federal University of Minhas Gerais (UFMG), located in Belo Horizonte, was chosen as the object of study for this research. The choice was made due to the availability of the information necessary for the research, since the Metamodel for PHOCt evaluation is directed to school spaces, the existence of climate data for Belo Horizonte in the Metamodel and, also, the possibility that the results of the research could be used as a diagnosis for future improvements in the University.

The possibility of applying the method in buildings of different geometries was evaluated and the results of the simplified method were compared with results obtained through computer simulation with the EnergyPlus software. The 82 buildings considered of interest for the study were divided into three groups according to the applicability of the method in relation to geometric aspects, namely: 1) applicable, 2) applicable with adjustments and 3) not applicable.

3. RESULTS

To make the evaluations of the percentage of hours in comfort more expeditious, the Metamodel proposed by INI-C is effectively easy to use and makes the process faster in relation to simulation. In this study the simulation process when compared to the Metamodel use needed more than 10 times more hours for its execution.

Nevertheless tt was observed that 16% of the buildings belong to group 1, 61% to group 2 and 23% to group 3. If the limits of thermal transmittance and absorption of the roof and limit of variation between APPs are also taken into account, only 1 building would meet the limits of the metamodel (1.2%). Group 1 buildings resulted in PHOCt between 53% and 97%, with buildings with higher occupancy densities and small indoor environments tending to have the worst results and those with lower thermal transmittances of the roof tending to have the best results. In addition, the simplified method was applied with modifications in 3 buildings that belong to group 2 and the results were compared with computer simulations. The percentage differences in the PHOCt ranged from 2% to 6%, which was considered a satisfactory result for the simplified method even with the necessary adjustments. For now, it is considered that the new method is capable of promoting a general evaluation of natural ventilation solutions in buildings, but to enhance its use it is necessary to evaluate acceptable adjustments in its input parameters, eliminating, for instance, the rule that internal spaces should vary only 10% in area.

http://dx.doi.org/10.29183/2447-3073.MIX2024.v10.n3.253-254
ISSN: 2447-0899 (IMPRESSA) | 2447-3073 (ONLINE)

REFERENCES

ALMEIDA, R. M. S.; FREITAS, V. P. Indoor environmental quality of classrooms in Southern European climate. **Energy and Buildings**, v. 81, p 127-140, 2014.

ASHRAE. Standard method of test for the evaluation of building energy analysis computer programs, **ASHRAE** 55-17. Atlanta, GA, 2017.

BRASIL. Ministério da Indústria, Comércio Exterior e Serviços. Instituto Nacional de Metrologia, Qualidade e Tecnologia (INMETRO). **Portaria n.º 248, de 10 de julho de 2018.** Consulta Pública - Aperfeiçoamento do Regulamento Técnico da Qualidade para a Classe de Eficiência Energética de Edifícios Comerciais, de Serviços e Públicos. Diário Oficial da União: seção 1, ano 155, n. 133, p. 335, Brasília, DF, 12 jul. 2018b. Disponível em: http://www.inmetro.gov.br/legislacao/rtac/pdf/RTAC002520.pdf. Acesso em: 12 maio 2020.

MEDEIROS, H. G. **Método simplificado de avaliação de conforto térmico para ambientes ventilados naturalmente ou híbridos do INI-C: desempenho e limitações.** Dissertação. Programa de Pós-Graduação em Ambiente Construído e patrimônio Sustentável da UFMG, 2022.

RACKES, A.; MELO, A. P.; LAMBERTS, R. Naturally comfortable and sustainable: Informed design guidance and performance labeling for passive commercial buildings in hot climates. **Applied Energy**, n. 174, p. 256-274, 2016. DOI: 10.1016/j.apenergy.2016.04.081

VELOSO, A. C. O.; SOUZA, R. V. G.; KOURY, R. N. N. Research of design features that influence energy consumption in office buildings in Belo Horizonte, Brazil. **Energy Procedia**, v. 111, p. 101-110, 2017.