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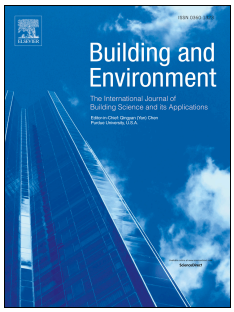

Comparative thermal study between conventional and bioclimatic office buildings

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Comparative thermal study between conventional and bioclimatic office buildings

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Abstract

The presented research focuses on the comparison of energy performance of a conventional versus a bioclimatic building, both continuously monitored. Attached buildings of offices located in Madrid, with main orientation N-S, have been built considering different constructive criteria. Principal Components Analysis has been used to check the representativeness criteria of the analysed offices. The Box and Whisker method concluded that the bioclimatic building has registered lower inter-quartile ranges for indoor temperatures than the convectional building. Thermal oscillations have been calculated for both buildings during winter and summer campaigns. The behaviour of the bioclimatic building is close to the summer thermal comfort band however during winter period values are slightly above because upper temperature limit has been exceeded. Thermal assessment of monitored offices has been done for representative days of summer and winter periods. The temperature variation of bioclimatic offices is more stable compared to conventional ones. Global primary energy consumption has been reduced from 124.58 kWh/m^2 year in conventional building up to 80.84 kWh/m^2 year in bioclimatic building.

Keywords: Bioclimatic building, representativeness, thermal comparative, monitoring.

1. Introduction

In the last century the world population has moved to the cities giving as result the increase of the urban consumption and the environmental pollution. This trend has led to the necessity of developing more efficient cities with net zero energy buildings [1], increasing the urban energy performance to minimize greenhouse gases emissions to the atmosphere, and mitigate the global warming [2,3].

Building sector is the second largest consumer of primary energy in the EU-28 [4]; however the sector has a great potential for energy savings reducing their environmental impact [5-6]. Improving energy efficiency and increasing the use of renewable energy sources are relevant key actions [7-8]. A description of the characteristics of EU buildings, as a basis for modelling the effect of improvements in