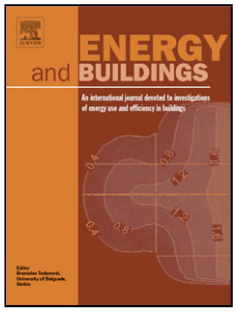

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Calibrated simulation of a public library HVAC systemwith a ground-source heat pump and a radiant floor using TRNSYS and GenOpt

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Abstract

Calibrating a simulation model is one of the most difficulttasks required to validate an energy conservation measure. To obtainan accurate calibration, it is necessary to collect all the performance data and estimate the missing information. In this study, aunique building with a heating and cooling system consisting of a ground-source heat pump and a radiant floor is simulated.The model was calibrated following ASHRAE and EVO specifications. The special characteristics of this building,located in Vigo in northwestern Spain, complicate the control of temperature and consequently the calibration. The simulation was performed with TRNSYS, and the optimization software GenOpt was used in an iterative calibration process.The results demonstrate that a simulation and calibration process using a detailed model with components from the TRNSYS library is sufficient to meet ASHRAE standards. In literature there is a lack of standards for calibration criteriaand this article explains and uses a valid method that semi-automated the calibration process. It was possible to reduce the mean bias error and the coefficient of variation of the rootmean squared error below 5% and 12%, respectively,by concentrating principally on the energy consumption of the system. The error made in the indoor temperature from the different airnodes was also investigated and an average value under 5 % was obtained.

Keywords: EVO, ASHRAE Guideline 14, ground-source heat pump, radiant floor, calibration.