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1 **Calibrated simulation of a public library HVAC system with a ground-**
2 **source heat pump and a radiant floor using TRNSYS and GenOpt**

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10 **Abstract**

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

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

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