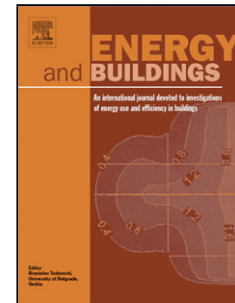


Accepted Manuscript

Title: An evaluation of the suitability of lumped-capacitance models in calculating energy needs and thermal behaviour of buildings

Authors: Jacopo Vivian, Angelo Zarrella, Giuseppe Emmi, Michele De Carli



PII: S0378-7788(16)31424-4
DOI: <http://dx.doi.org/doi:10.1016/j.enbuild.2017.06.021>
Reference: ENB 7684

To appear in: *ENB*

Received date: 3-11-2016
Revised date: 10-4-2017
Accepted date: 10-6-2017

Please cite this article as: Jacopo Vivian, Angelo Zarrella, Giuseppe Emmi, Michele De Carli, An evaluation of the suitability of lumped-capacitance models in calculating energy needs and thermal behaviour of buildings, Energy and Buildings <http://dx.doi.org/10.1016/j.enbuild.2017.06.021>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

An evaluation of the suitability of lumped-capacitance models in calculating energy needs and thermal behaviour of buildings

Jacopo Vivian^{1*}, Angelo Zarrella¹, Giuseppe Emmi¹, Michele De Carli¹

¹ Department of Industrial Engineering - Applied Physics Section, University of Padova, Via Venezia 1 – 35131, Italy

*Corresponding author: Tel.: +39 049 827 6879. E-mail address: jacopo.vivian@dii.unipd.it

Highlights

- The accuracy of ISO 13790 and VDI 6007 simplified building models is assessed.
- Different envelopes and weather data are considered for both heating and cooling.
- The 1C model deviates critically from TRNSYS when high heat gains occur.
- The 2C model is suitable for both heating and cooling modes.

Abstract

Simple, reliable building models have been receiving quite a bit of attention recently particularly with regard to diverse applications, such as building design for inexperienced energy modellers, simulation of neighbourhood or city districts and model predictive control. The International Standard ISO 13790 and the German Guideline VDI 6007 use two different lumped-capacitance models (5R1C and 7R2C, respectively) based on deterministic, analytical procedures to identify their parameters. The current work investigates the suitability of these models in calculating peak loads and seasonal energy needs and their accuracy in estimating buildings' dynamic behaviour. A room and an apartment were thus simulated using simplified models and with the benchmarked software TRNSYS. Four reference envelopes with different thermal insulation and heat capacities were examined in four climatic conditions. Each of the models was able to estimate quite precisely energy needs in both the heating and cooling modes, although the 7R2C model was slightly more accurate. The 5R1C model

Download English Version:

<https://daneshyari.com/en/article/4914134>

Download Persian Version:

<https://daneshyari.com/article/4914134>

[Daneshyari.com](https://daneshyari.com)