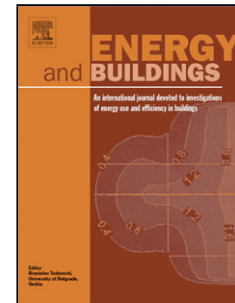


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A novel model for the evaluation of heat accounting systems reliability in residential buildings

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Highlights

- Heat accounting is an essential tool for increasing energy efficiency of buildings
- Indirect heat accounting systems are used when direct ones are unfeasible
- The reliability of indirect systems for heat sharing in buildings is almost never evaluated
- A novel model for the analysis of reliability of indirect systems has been developed and validated
- The proposed model should be a useful tool to assess indirect system reliability for design, installation and use.

ABSTRACT.

Directive 2012/27/EU on energy efficiency has set the obligation to install individual meters or indirect systems (e.g. heat cost allocators) for heat accounting in multi-apartment buildings supplied by district heating or common central heating. Unfortunately, despite the need of consumers' protection, neither legal metrology requirements are available for indirect heat accounting systems nor applicable technical standards specify the related on-field maximum permissible errors. In fact, the peculiarity of such systems is the high number of interconnected devices and the influence of installation and operative conditions on their on-field metrological performances should be significant.

In this paper, a statistical model to estimate and predict the on-field reliability of heat accounting systems is proposed. The developed model has been applied and validated in three different case studies (i.e. a two-family house, a small building, a large multiple building) showing a good agreement with experimental data. The uncertainty of indirect heat accounting systems in different operating conditions ranges from about 2.7 % (i.e. in a large multiple building in optimal conditions) to about 11.7 % (i.e. in a two family house in critical conditions). The developed model allows to assess the influence of installation conditions with particular reference to the number and type of radiators and their installation, also in respect with single apartments' peculiarities and usage. Therefore, the model can be adopted to design appropriate accounting systems in new buildings and to assess the system reliability in the existing ones.

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