

Editorial

Special Issue “Recent Developments in Building Physics”

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1. Introduction

The Special Issue “Recent Developments in Building Physics” was established to provide extended outputs from the 4th Central European Symposium on Building Physics that was held in Prague, Czech Republic, on 2–5 September 2019. The symposium has been organized successfully over 10 years in the major cities across the Central Europe.

However, since the field of building physics plays important role among the scientific disciplines in the feature and covers wide range of topics, the Guest Editors agreed to also invite other building physicists from all over the world to contribute and share their recent knowledge to face the growing challenges arising from demands in the field of building physics. The objective of this Special Issue was to enhance the knowledge base and to stimulate an innovative culture in the building sector. Therefore, the Special Issue was aimed at providing recent developments in any field of building physics, covering a wide range of scientific topics that include but are not limited to the following:

- Building materials and components;
- Building envelope systems;
- Indoor climate and human comfort;
- Energy performance;
- Environmental impact and damage assessment;
- Life-cycle assessment;
- Retrofit and conservation of buildings.

2. Special Issue Content

In total, 10 papers related to building physics has been accepted and published in the Special Issue. The variety of topics that can be included to the building physics has become evident among the diversity of the accepted papers. Most of them were written on heat and energy transfer and efficiency-related issues; however, acoustic and biological issues were also addressed in this Special Issue as well.

S. Owczarek and M. Owczarek [1] proposed a new method for determination of steady-state and dynamic heat fluxes in building envelope design. They showed how to solve different states in heat demands analysis and how to decompose boundary tasks and reduce the number of unknowns in the problem solution. Nikistin et al. [2] proposed a method for determining an effective value of the thermal conductivity for moist, highly porous rigid polymer foams. The model of moist foam was developed in accordance with the moisture distribution in the pore space. The proposed model was used in the computational analysis for investigation of the influence of vapor diffusion, moisture content, and average temperature of the foam on its thermal conductivity. Lakatos and

Trník [3] showed how the most important properties of aerogel blankets, such as thermal diffusivity, effusivity and thermal inertia, are changed after thermal annealing. The results can be very beneficial in the practical applications, for example for U -value calculations. Elguezabal et al. [4] assessed a novel design concept for a façade system based on a steel sandwich panel technology. They provided a proof about the benefits of a synergetic combination of solar facades and heat pumps technologies as efficient alternatives for the building sector. They concluded that such a solution may improve energy efficiency as well as reduce dependence on non-renewable sources. Jasiński [5] addressed the issue of modelling the demand for electricity in residential buildings with the use of artificial neural networks using data from six houses in Switzerland. His research confirmed the possibility of using artificial neural networks to model the disaggregation of electricity consumption based on low frequency data, and suggested ways to build highly optimized models.

Kočí V. et al. [6] investigated shortcomings of the application of the thermal insulation layer in the composition of retrofitted historical building envelopes, such as the decrease in exterior surface temperature or possible water condensation. Therefore, they aimed at the investigation of hygrothermal conditions in selected critical construction details and evaluated the results from the point of view of potential biofilms growth. Li, Dang et al. [7] quantified the potential mold growth risks due to air leakage through air cavity in an office room situated in a building made from historical masonry. They concluded that air leakage through air cavities proved to be a crucial factor for mold growth in historical objects. Li, Feng et al. [8] examined the effect of the current protective shed on the Eastern Wu tomb. For this reason, they performed environmental monitoring in the tomb and developed the hygrothermal transfer model of the protective shed to assess its impact on the condensation risk.

Nowotny and Nurzyński [9] focused on acoustic properties of floors with the objective of developing effective insulating layers of lightweight floors intended for use in residential buildings. Their findings demonstrated how different lightweight floor components influence the acoustic performance of the floor and how the insulating layers cooperate when applied together.

Zach et al. [10] were motivated for their research by searching for new, advanced building materials due to the necessary diminution of energy performance and CO₂ emissions associated with building and the production of building materials. Their work represents an initial part of the development of alternative insulators, based on agricultural and textile industry waste usable in the production of vacuum insulation panels, by reviewing basic knowledge regarding key thermal insulation properties of developed insulators and their fire reactions, which impact possible usage in building structures.

3. Closing Remarks and Future Challenges

The articles presented in the Special Issue cover important aspects of building physics. Even if building physics is a very wide topic, this small contribution can stimulate the community to develop current research and improve its progress. Therefore, we believe that the presented papers will have practical importance for the forthcoming development in the building physics sector.

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References

1. Owczarek, S.; Owczarek, M. Heat Transport Analysis in Rectangular Shields Using the Laplace and Poisson Equations. *Energies* **2020**, *13*, 1714. [[CrossRef](#)]
2. Nikitsin, V.I.; Alsabry, A.; Kofanov, V.A.; Backiel-Brzozowska, B.; Truszkiewicz, P. A Model of Moist Polymer Foam and a Scheme for the Calculation of Its Thermal Conductivity. *Energies* **2020**, *13*, 520. [[CrossRef](#)]
3. Lakatos, Á.; Trník, A. Thermal Diffusion in Fibrous Aerogel Blankets. *Energies* **2020**, *13*, 823. [[CrossRef](#)]

4. Elguezabal, P.; Lopez, A.; Blanco, J.M.; Chica, J.A. Assessment on the Efficiency of an Active Solar Thermal Facade: Study of the Effect of Dynamic Parameters and Experimental Analysis When Coupled/Uncoupled to a Heat Pump. *Energies* **2020**, *13*, 597. [[CrossRef](#)]
5. Jasiński, T. Modelling the Disaggregated Demand for Electricity in Residential Buildings Using Artificial Neural Networks (Deep Learning Approach). *Energies* **2020**, *13*, 1263. [[CrossRef](#)]
6. Kočí, V.; Kočí, J.; Maděra, J.; Žák, J.; Černý, R. Computational Prediction of Susceptibility to Biofilms Growth: Two-Dimensional Analysis of Critical Construction Details. *Energies* **2020**, *13*, 293. [[CrossRef](#)]
7. Li, Y.; Dang, X.; Xia, C.; Ma, Y. Daisuke Ogura and Shuichi Hokoi, The Effect of Air leakage through the Air Cavities of Building Walls on Mold Growth Risks. *Energies* **2020**, *13*, 1177. [[CrossRef](#)]
8. Li, Y.; Feng, Y.; Kong, Z.; Hokoi, S. Optimization and Assessment of the Protective Shed of the Eastern Wu Tomb. *Energies* **2020**, *13*, 1652. [[CrossRef](#)]
9. Nowotny, Ł.; Nurzyński, J. The Influence of Insulating Layers on the Acoustic Performance of Lightweight Frame Floors Intended for Use in Residential Buildings. *Energies* **2020**, *13*, 1217. [[CrossRef](#)]
10. Zach, J.; Novák, V.; Peterková, J.; Bubeník, J. Development of Vacuum Insulation Panels with Utilization of Organic By-Products. *Energies* **2020**, *13*, 1165. [[CrossRef](#)]

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