

Reconstructing the Indoor Climate of Historic Buildings

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ABSTRACT

In general, a building survey includes geometry, structure, construction, material, damages and history. In historic buildings over the time the building structure and usage can vary a lot. Floor plans were adapted or just materials on the wall surface or floorings have changed, the original design gets lost.

If a room offers good conditions, it will be used accordingly. The usage criteria are not limited to geometric and visual design features but also include thermal comfort. When determining the use of historical rooms and buildings, it makes sense to combine the results of the construction survey and literature research with a reconstruction of the indoor climate. Constructive adjustments, spatial expansions and social developments lead over time to a deviation from the originally planned and executed situation.

Which parameters have to be known to reconstruct the indoor climate of a historic building?

This publication describes on three examples the requirements and procedure for determining the use of rooms that are no longer in their original state. The reconstructed spaces are a traditional residential building in Jeddah (Saudi Arabia) [1], an art gallery in Yogyakarta (Indonesia) [2] and an office in a former tobacco factory in Krems (Austria) [3].

Dynamic hygrothermal simulation of building elements show the ability of materials to influence the indoor climate and the interaction between construction and indoor climate. By monitoring or defining the user's presence and activities in a room the thermal interaction between construction and indoor climate is calculated. The detection of the airflow around and through the building provides important parameters for the assessment of thermal indoor comfort. The results were compared with the use of space, as described in the literature or expected from building survey.

The method of reconstructing the indoor climate in historical buildings works. The results provide information for the evaluation of the so far known initial situation. Such findings can be used to adapt the building to new user requirements or to new climatic circumstances. With little extra effort, archaeologist, construction historians or surveyors need to collect and document additional data for dynamic thermal construction and building simulations. Therefore, the interfaces in the procedure must be recognized, understood and defined. The development of the building analysis must take into account new technical possibilities and requires the interdisciplinary cooperation of various branches of science.

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[2] Herbig, U.; Styhler-Aydin, G.; Grandits, D.; Stampfer, L.; Pont, U.: *The Architecture of the Affandi Museum – Approaches to a Piece of Art*. 3rd Biennale ICIAP - International Conference on Indonesian Architecture and Planning, Yogyakarta, Indonesia 2016.

[3] Stumpf, W.; Winkler, M.; Trauninger, D.; Treytl, A.; Bratukhin, A.: *CoolAIR - Automatisierung von Kastenfenstern zur Raumkühlung*. Fachhochschule Burgenland, Tagungsband e-nova "Gebäude der Zukunft?", Band 22: 59-66, Leykam Buchverlagsgesellschaft, Pinkafeld, Austria 2018.