



THE WALL HEATING SYSTEM (TEMPERIERUNG) AT BREZICE CASTLE IN SLOVENIA

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ABSTRACT: Wall tempering system was installed in Small Auditorium, southwest tower-room of Brežice Castle, in order to study the expected benefits, possible side effects, and to provide basic design guidelines for stakeholders. This pilot case study allowed Building and Civil Engineering Institute ZMRK (BCEI ZMRK) to make a comparison with other reference towers within the same site, where wall-heating system has not been installed yet, e.g. exhibiting room of Armoury, located in northeast tower. Research work has also included aspects of energy efficiency of the build-in system and its impact on the microclimate.

BCEI ZMRK had performed outdoor and indoor climate measurements (air temperature and relative humidity) from December 2011 until April 2013. Comparison of actual measurements with those from IDA-ICE software simulations allowed the verification of both, unheated and heated, Hygrothermal simulation models. Verified models enabled more reliable forecast on how future climate changes would influence microclimatic conditions and evaluation of implemented mitigation strategy impacts. Evaluation of results based on the set of ASHRAE classification guidelines.

Optimized computer models, with carefully defined parameters and boundary conditions, proved to be adequate and appropriate for further work purposes. Discrepancies between actual and simulated results were insignificant and this applied to both, unheated (Armoury) and heated (Small Auditorium) model. Considered conceptual solution of wall tempering proved to have many benefits, e.g. reduction of humidity level in walls, improved thermal comfort for visitors in more energy efficient manner - higher surface temperatures of surrounding wall parts allow lower air temperatures to achieve same or better level of thermal comfort-, and ASHREA classification showed improvements in inner air microclimatic conditions with smaller-scale fluctuations of temperature and relative humidity.

Arguments make this mitigation strategy definitely an option that is worth considering for future implementations at similar sites. Studies have shown that we have the right tools at our disposal, which can give decision makers relevant instructions for more preventive conservation of cultural heritage sites, and at the same time also address aspects of energy efficiency