

## **Internal building insulation systems for historic buildings: hygrothermal performance analysis**

MARTA CALZOLARI<sup>1</sup>, PIETROMARIA DAVOLI<sup>2</sup>, LUISA DIAS PEREIRA<sup>3</sup>

<sup>1</sup> University of Parma, Department of Engineering and Architecture, PR 43124, Italy; marta.calzolari@unipr.it

<sup>2</sup> University of Ferrara, Department of Architecture, Architettura>Energia Research Centre, FE 44121, Italy; pietromaria.davoli@unife.it

<sup>3</sup> University of Ferrara, Department of Architecture, Architettura>Energia Research Centre, FE 44121, Italy; dsplmr@unife.it

### **Abstract**

Promoting the adaptive re-use of heritage buildings is one of three clusters of actions of the European Framework for Action on Cultural Heritage, 2018. To make this operation successful, it is necessary their adaptation to today's indoor comfort requirements and therefore, there is the need to support the energy retrofitting of historic buildings (HB).

Often, when in the presence of HB with high heritage value, the energy retrofit intervention is limited to the internal face of the building envelope (when not in the presence of valuable decoration): no changes are introduced in the façade, at the expense of the loss of recognition of the characteristics of the original building. This strategy can give rise to fundamental risks: using internal insulation layers can alter the original behaviour of historic envelope leading to problems of interstitial condensation or superficial moisture.

The HeLLO project (H2020-MSCA-IF-2017-EF) is based on this assumption, aiming at verifying the performance of some insulation solutions for the interior façade of historic buildings (through hygrothermal simulation software and in situ measuring tests). The research's case study is Palazzo Tassoni Estense, a renaissance Palace in Ferrara.

Within this paper, authors explore and discuss some of the criticalities and hygrothermal risks addressing internal thermal insulation systems for historic buildings, combining the preliminary results of the field activities to the theoretical simulations.

**Keywords:** *Cultural Heritage, Energy retrofit, Historic building, Hygrothermal performance, In situ monitoring, Simulation*