

Structural assessment of Cultural Heritage buildings using HBIM and vibration-based system identification

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ABSTRACT

The assessment of historic masonry buildings is a challenging multidisciplinary activity, involving different tasks. Firstly, the data resulting from historic research and direct inspections are complemented with geomatic survey in order to obtain important information on the as-built geometric layout, the probable building techniques, the construction phases, the sequence of transformations and repairs as well as the mapping of discontinuities and damage. The information collected in the previous steps might be summarized through the creation of a Heritage Building Information Model (HBIM) [1]. Subsequently, dynamic tests in operational conditions provide quantitative parameters (i.e., resonant frequencies, mode shapes and damping ratios), which are representative of the structural condition and remarkably contribute to the knowledge of the building. Merging the information collected by historic/architectural research, HBIM and dynamic tests should allow to solve the main uncertainties in establishing numerical models [2] and to assess the structural state of preservation of the building in a fully non-destructive way.

The paper exemplifies the application of the methodology involving historic and architectural research complemented by HBIM and dynamic survey in the structural modelling and assessment of the so-called *Galleria degli Antichi* [3] in the historic town of Sabbioneta (Italy). This monumental building was built in the 16th century and it is included in the UNESCO World Heritage list since 2008.

Full details on the history of the building and the information obtained in the non-destructive survey are given in the paper. The good knowledge of the structural geometry, along with the complete inspection carried out and the large number of identified vibration modes, allowed to establish a numerical model of the monumental building for a first quantitative assessment of its structural condition.

REFERENCES

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