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# AN INTEGRATED BIM METHODOLOGY FOR THE SEISMIC ASSESSMENT OF MASONRY BUILDINGS

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## SUMMARY

Building Information Modelling is one of the most innovative and promising technologies that are taking place in the construction industry. However, BIM implementation in structural engineering is not as common as in architectural design and this becomes more evident dealing with the maintenance and refurbishment of existing buildings. In this context, the implementation of an integrated BIM methodology for the assessment of the seismic performance of existing masonry buildings is proposed based on a non-linear static algorithm, called E-PUSH, previously developed by the authors. An effective workflow is defined, relying on software's interoperability at the architectural and structural level, able to create a dynamic, customized and flexible procedure. The proposed methodology has been developed and critically analysed through real case studies and it may be extended to an increasingly broad collection of existing buildings. It offers an integrated solution for the assessment and management of existing buildings by means a continuous updating of the information model.

**Keywords:** *BIM, Masonry, Maintenance, Refurbishment, Seismic Assessment.*

## 1. INTRODUCTION

Building Information Modelling (BIM) is a planning, design, construction and maintenance process that uses an information model of a building, new or existing, that contains all the information regarding its entire life cycle. The above definition, given by the National Building Information Modelling Standard (NBIMS), an organ of the National Institute of Building Sciences (NIBS) [1], focuses on the object that is created within BIM. It is a parametric three-dimensional model of the building, in which each element has properties and relates to other elements in accordance with certain rules. The main aspect that characterize BIM with respect to the traditional CAD-2D approach, is the possibility to associate information to objects such as materials, geometric, structural, energy or cost properties. In 2D models, digital files are made up of vector objects to which only display parameters are associated, such as line styles, colour and thickness. In BIM, the geometrical entities are of parametric type and this leads to a series of considerations: the dimensions are associated to defined parametric rules; the change of the value of a parameter causes the change of all the entities connected to it; the various model views, 2D or 3D, are consistent between them, because they refer to the same information model [2, 3]. The adoption of the BIM methodology has a significant influence on the design process, in order to speed up the production of documents, through the simultaneous work of all the participating figures who share the same information model and the possibility of exchanging information by means of Industry Foundation Classes (IFC) data file [2].The integrated parametric design, which quickly spread in a multifaceted way in the sector of new buildings, is still in an experimental phase for historical buildings, focusing today on the reconstruction of the geometries, the cataloguing of the documentation and the energy requalification of existing buildings [4, 5]. The implementation of structural information in BIM can effectively enhance programmed building maintenance, a fundamental aspect for the preservation of historical buildings. Including in a single digital environment historical data, transformations and restoration interventions undergone over the centuries, makes possible a constant monitoring of the construction, with a continuous update of information [4, 5].

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