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HERITAGE MASONRY BUILDINGS USING  
NUMERICAL MODELLING

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**ASSESSMENT OF SEISMIC BEHAVIOUR OF HERITAGE MASONRY BUILDINGS USING  
NUMERICAL MODELLING**

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**Keyword:** Earthquake loading; FE Modelling; 3D smeared crack model; Equivalent Frame Method; Nonlinear static analysis; School buildings; Seismic vulnerability; Typical seismic vulnerabilities

## Abstract

The paper analyzes the seismic vulnerability of the historical complex of “*San Francesco*” located in Cagli, Marche Region, Italy. It provides both advanced 3D modelling with solid elements and equivalent frame modelling. The building is composed of a church and a monastery used as a lower secondary school, and preservation and maintenance of its structural efficiency are of primary importance. The global structural behaviour and dynamic properties of the compound have been evaluated using the Finite Element Modelling (FEM) technique, where the nonlinear behaviour of masonry has been taken into account by proper constitutive assumptions. A sensitivity analysis is done to evaluate the effect of the choice of the control point on the value of seismic risk index, by varying the stiffness of the floors and the effects of different knowledge levels. The aim of the paper is to emphasize the importance of thorough knowledge of historic buildings in order to understand the real seismic behaviour of a structure, to detect common vulnerability of this type of building, the knowledge of which is necessary to design restorations aimed at improving the seismic behaviour of masonry buildings. Some comparisons with the Equivalent Frame Method (EFM) are also presented.

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