

Constructive analysis and modelling of a single nave church: a proposal for S. Sebastiano (EN, Italy)

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ABSTRACT

The seismic events occurred in Italy in the last decay (L'Aquila 2009, Emilia 2012, Central Italy Earthquakes 2016/2017) have caused the collapse of numerous historical buildings and monuments with loss of life and irreversible damages to the cultural heritage. An effective seismic prevention would avoid, or delay, the most frequent collapse mechanisms. However, it requires a correct interpretation of the structural mechanical behaviour. With regard to the traditional masonry buildings, this issue presents a high level of complexity due to the uncertainties related to the materials and the constructive techniques. Furthermore, historic buildings are often the result of several modifications that induce significant structural irregularities. A possible strategy of analysis is provided by a discrete macro-element modelling (DMEM) approach [1] which is able to simulate the global behaviour of traditional fabrics, if supported by an adequate level of historic, geometrical, constructive and structural knowledge [2].

In this paper a multidisciplinary procedure is applied to the church of S. Sebastiano in Regalbuto (Italy), considered as case study. This procedure is composed of three steps: the knowledge phase in which the constructive apparatus and the static schemes are identified, the modelling phase and the assessment phase in which the current safety level of the building and possible interventions that would be compatible with its cultural instance, are individuated [3,4]. According to the followed procedure, different scenario of intervention, characterised by increasing levels of benefit and invasiveness, are considered. For each scenario, non-linear static push-over analyses are performed, the interventions are designed, evaluating each benefit and identifying the structural critical issues, useful to individuate the next scenario. The results are presented and discussed both in terms of capacity curves and failure mechanisms.

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