

# Evaluation of the seismic performance of the Santa Maria Maddalena Church in Ischia, Italy

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## ABSTRACT

The technology of the Borbonic *casa Baraccata* is one of the earliest earthquake resisting systems, used since the 18<sup>th</sup> century across Southern Italy in response to the disastrous earthquakes that hit the region frequently. The structural performance of the Italian mixed timber-masonry solution has been studied by [1] and [2], while investigations on similar systems were carried out by [3]. The church of Santa Maria Maddalena in Casamicciola Terme, Ischia Island, Italy, represents one of the very rare examples, with a unicity lying on the materials adopted. It presents the regular Borbonic *Baraccato* walls in the back portion, and tuff-masonry walls embraced in iron frames in the main body. The church was stroke by the recent earthquake of 21<sup>st</sup> August, 2017 with epicenter in Casamicciola Terme. Though the moderately high seismic intensity of the event, the post-seismic surveys did not evidence relevant structural damage thanks to the constructive systems. The paper aims at presenting a better understanding of the structural performance of the church under vertical and horizontal loads. The scope is addressed through the development of a 3D Finite Element Model (FEM) calibrated taking advantage of the ambient vibration tests performed under operational conditions [4]. Sensitivity analyses allowed to inspect and validate the modelling strategies adopted and the relevance of the data still unknown. The evaluation of the seismic performance is carried out through the application of non-linear static analyses to different model versions, capable of describing a possible range of responses. The numerical models namely involve the response of the structure under the assumption of a behavior mainly governed by the non-linear response of the masonry walls, discarding the contribution of the *Baraccato* frames (lower-bound response), conversely a second model was analyzed by taking the response of the frames as infinitely elastic (upper-bound response).

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