Documentation and Structural Appraisal of the Medieval Manor of Potamia, Cyprus: an interdisciplinary approach

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ABSTRACT

This paper presents an interdisciplinary study concerning the documentation and structural appraisal of a Medieval Manor located in Potamia, Cyprus. The case study monument is an impressive complex of masonry structures, part of which is nowadays in ruins. A comprehensive review of historical sources was carried out in order to obtain data concerning the history and construction evolution of the Manor. It was verified that the monument incorporates different building phases dating from the 14th to the 20th century. Architectural typology and construction detailing was examined via in-situ investigations and topographic surveys. These enabled the identification of the elements composing the structural system. The latter consists of a combination of stone and adobe masonry load-bearing walls, upon which timber floors and roofs rest. Extensive field work was undertaken to explicitly map the various agents of pathology. Significant structural damage was detected, including partial collapses, separation among orthogonal walls and extensive cracking. Furthermore, it was noted that the building materials suffer from moisture-driven decay due to inadequate protection against ground and rainwater infiltration. For the characterization of the historic fabric, masonry materials were sampled and studied at the laboratory. The investigation included the evaluation of the most important physico-mechanical properties of the masonry units (namely building stones and adobe bricks) and the fractionation and mineralogical analysis of selected mortar samples. According to the outcomes obtained, a porous sedimentary stone of relatively low compressive strength (< 10 MPa) was used for the construction of the stonework, along with lime- and gypsum-based jointing and coating mortars. Poor mechanical properties were determined in the case of adobe materials, owing to the susceptibility of raw earth to water-mediated damage. The accumulated data was utilized for the development of a 3D Finite Element (FE) model with the aim of examining the seismic response of the monument. Numerical results were found to be in accordance with the recorded damages, thereby proving the validity of the computational model. Complementary to the FE modelling, the kinematic method was used for the investigation of local collapse mechanisms. Analyses revealed that the monument is particularly vulnerable to seismic actions. It was also confirmed that its response is adversely affected by inherent deficiencies, such as the lack of monolithic connections and the absence of stiff diaphragms, as well as by the pathology it exhibits. The multifaceted approach hereby adopted clearly shows that interdisciplinary collaboration is a key aspect for the comprehensive appraisal of historic constructions and hence a prerequisite for the design of appropriate intervention schemes.