

## **Typological Study of Unreinforced Masonry Structures by means of Macro-element Nonlinear Dynamic Analyses**

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### **ABSTRACT**

It has been evidenced by post-earthquake surveys that Unreinforced Masonry Structures (UMS) experience severe damage when subjected to seismic actions. The most common failure mechanisms identified in this type of constructions correspond mainly to in-plane, and out-of-plane responses of the masonry walls namely rocking, toe crushing, diagonal cracking, bed joint sliding, one- and two-way bending collapse. During the last decades, non-linear dynamic analyses with time integration have become a reliable tool for the seismic assessment of masonry structures. However, the application of these analyses requires a significantly high computational effort due to the size of the numerical models as well as the complexity of the constitutive laws. In this scope, an innovative approach based on macro-elements has been implemented for the assessment of the seismic response of unreinforced masonry structures in the dynamic field. Due to the philosophy of the macro discretization, this modelling approach allows an important reduction of the computation effort, making it suitable for practical applications. In this work, a parametric investigation is carried out on one structural typology of unreinforced masonry constructions, as an initial step for the assessment of its seismic vulnerability by means of fragility curves. This investigation is based on the application of an extensive number of nonlinear dynamic analyses aiming at the assessment of the influence of parameters such as mechanical properties and input motion data in the seismic response of this structural typology. These results will provide a useful tool for the seismic safety of unreinforced masonry structures as well as the mitigation of the seismic risk associated to existing buildings.