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NON-DESTRUCTIVE EXPERIMENTATION: DYNAMIC IDENTIFICATION OF MULTI-LEAF MASONRY WALLS DAMAGED AND CONSOLIDATED

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ABSTRACT

The dynamic monitoring of multi-leaf masonry wall is here proposed. The results of non-destructive tests carried out in this work are a first part of a wider testing campaign aimed at verifying the structural performance of masonry walls. Multi-leaf masonry walls constitute the composite construction typology most widely adopted in historic buildings. This aspect, together with the intrinsic structural complexity, heterogeneity and irregularity, directs the present research towards a topic not yet sufficiently investigated by the scientific community. In this paper, the case of multi-leaf masonry wall has been investigated, and with the aim of reproducing historical buildings structural elements, three different typologies of multi-leaf masonry walls have been considered: (i) full infill, (ii) damaged infill, (iii) consolidated infill.

Several masonry specimens of the above-described typologies have been built and tested in lab. The dynamic parameters, such as frequencies, modal shapes and damping ratios have been identified through the output-only procedure and the data were processed through the Least Square Complex Frequency (LSFC) estimator; the analysis of results allowed to evaluate the structural integrity, the efficacious of consolidating intervention and the potential performance mechanisms of different complex multi-leaf masonry walls.

Experimental results are compared with numerical Finite Elements models. Composite multi-leaf masonry is modelled as an equivalent continuum obtained through a full 3D homogenization procedure. The mechanical properties of component materials have been obtained in lab by tests and then used to model the masonry at the micro-scale in order to derive the mechanical properties to be adopted at macro-scale. A parametric natural frequencies analysis is performed in order to calibrate the model by the comparison whit the experimental measures.

Keywords: *Dynamic Identification, Multi-leaf Masonry Walls, Non-Destructive Testing, Finite Elements Analysis, Mechanical properties.*