Experimental Investigation on IMG masonry reinforcement

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Abstract. Interest about the sustainable techniques to reinforce existing structures is growing, in particular regarding to masonry structures. In this field of study there are already several experimentations that shown, about different kinds of masonry, the comparison among many reinforcement systems.
The present paper resumes the original results of two experimental campaign and it collects the data of previous tests carried out by the authors on the other masonry typologies. The first experimental campaign is related to five tests on uncoursed stone masonry panels while the second one is related to nine regular limestone masonry both under diagonal compression. The tests results on several masonry types and strengthening layouts as well as Fiber reinforced Polymer (FRP) grid and mortar types are reported and discussed. The experimental programs clearly confirmed the effectiveness of the investigated strengthening technique to increase the panels shear capacity and ductility; however, a suitable theoretical expression to quantify the benefits provided by this strengthening solution, based on the reinforcement layout and on the masonry type, is still missing. The comparative analysis of the experimental data is presented in the paper in order to clarify the benefits provided by each strengthening system.

Introduction

A wide branch of engineering study focuses its attention on reinforcement of existing structures, due the increasing request of interventions, expecially in the seismic areas.
Thanks to that, several strengthening techniques are available to reduce the seismic vulnerability of existing buildings; however, some of these techniques may be too invasive or expensive. Strengthening solutions based on the use of technologies and materials compatible with physical and mechanical properties of masonry are required to enhance the performance of existing buildings. Among new strengthening strategies, the use of Fiber-Reinforced Polymer (FRP) combined with inorganic matrix (IMG) offers a series of advantages as the high strength-to-weight ratios, low influence on global structural mass, corrosion and fatigue resistance, easy handling and installation, and negligible architectural impact [1,2].
The effectiveness of this technique has been evaluated by means of different experimental programs on masonry panels tested under diagonal compression [3,4,5]. Simplified analytical models to assess the masonry shear capacity and ductility increase due to this strengthening solution are still lacking; a simplified procedure is reported in [6] which reports an equation to determine the masonry panel in plane capacity based on the reinforcement amount and masonry type. In spite of considerable research experimental efforts, Italian guidelines and codes do not supply a numerical model; therefore practitioners commonly adopt corrective coefficient to increase the original

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