

Experimental Characterization of Masonry Materials from Damaged URM and Confined Masonry Buildings in Kruja

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Abstract. Recent earthquakes in Albania also revealed the insufficient design/detailing or quality control for the construction of masonry buildings. In many cases, the properties of the constructed/used materials are unknown. This paper presents the results of laboratory testing of material taken from two neighboring residential buildings in Kruja which attained Damage State 4 (DS-4) during the 26 November 2019 earthquake. The buildings have similar geometry and construction period, but different structural systems (one unreinforced masonry, the other reinforced concrete tie columns, a weak form of confined masonry). Compression tests were carried out on brick, mortar samples, and cores of concrete from the confinement elements. The strengths indicate similar poor quality masonry materials in the two structures, with mortar strength at 2.0-2.5 MPa, brick strength of 4.0-5.0 MPa, and tie-column concrete strength of only 10–12 MPa. This research has led to the conclusion that the extensive cracking and overall damage inflicted to both buildings are mostly associated with poor material properties. The inclusion of weak confinement members only offers a marginal contribution to strain control of the cracking. The experimentally acquired parameters can be used to conduct reasonable further nonlinear studies and seismic retrofit assessment on similar types of masonry structures.

Keywords: Unreinforced masonry; Confined masonry; Laboratory testing; Masonry materials; Seismic damage; Kruja

DOI: <https://doi.org/10.15157/tultechbook.3.c12>

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