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The Influence of Strengthening on the Fundamental Frequency and Stiffness of a Confined Masonry Wall with an Opening for a Window

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Abstract : Shaking table tests are planned in order to deepen the understanding of the behavior of confined masonry structures with or without openings. The tests are realized in the laboratory of the Institute of Earthquake Engineering and Engineering Seismology (IZIIS) – Skopje. The specimens were examined separately on the shaking table, with uniaxial, in-plane excitation. After testing, samples were strengthened with GFRP (Glass Fiber Reinforced Plastic) and re-tested. This paper presents the observations from a series of shaking-table tests done on a 1:1 scaled confined masonry wall model, with opening for a window – specimens CMWuS (before strengthening) and CMWS (after strengthening). Frequency and stiffness changes before and after GFRP wall strengthening are analyzed. Definition of dynamic properties of the models was the first step of the experimental testing, which enabled acquiring important information about the achieved stiffness (natural frequencies) of the model. The natural frequency was defined in the Y direction of the model by applying resonant frequency search tests. It is important to mention that both specimens CMWuS and CMWS are subjected to the same effects. The initial frequency of the undamaged model CMWuS is 18.79 Hz, while at the end of the testing, the frequency decreased to 12.96 Hz. This emphasizes the reduction of the initial stiffness of the model due to damage, especially in the masonry and tie-beam to tie-column connection. After strengthening the damaged wall, the natural frequency increases to 14.67 Hz. This highlights the beneficial effect of strengthening. After completion of dynamic testing at CMWS, the natural frequency is reduced to 10.75 Hz.

Keywords : behaviour of masonry structures, Eurocode, frequency, masonry, shaking table test, strengthening
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