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

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Abstract : 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 door – specimens CMDuS (confined masonry wall with opening for a door before strengthening) and CMDS (confined masonry wall with opening for a door after strengthening). Frequency and stiffness changes before and after GFRP (Glass Fiber Reinforced Plastic) 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 CMDuS and CMDS are subjected to the same effects. 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 and re-tested. The initial frequency of the undamaged model CMDuS is 13.55 Hz, while at the end of the testing, the frequency decreased to 6.38 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 of the damaged wall, the natural frequency increases to 10.89 Hz. This highlights the beneficial effect of the strengthening. After completion of dynamic testing at CMDS, the natural frequency is reduced to 6.66 Hz.

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