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Verifying ASCE 41 the evaluation model via field tests of masonry infilled RC frames with openings

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ABSTRACT

The in-situ pushover test differs from the shake-table test because it is performed outdoors and thus its size is not restricted by space, which allows us to test a full-size building. However, to build a new full-size building for the test is not economical, consequently scholars around the world usually make scale structures or full-scale component units to be tested in the laboratory. However, if in-situ pushover tests can be performed on full-size structures, then the seismic behaviors of buildings during earthquakes can be grasped. In view of this, this study conducts two in-situ pushover tests of reinforced concrete (RC) buildings. One is a masonry-infilled RC building with openings (the openings ratio of masonry infill wall is between 24% and 51%) and the other is an RC building without masonry infill. These two in-situ pushover tests adopt obsolescent RC buildings, which will be demolished, to conduct experiment and successfully obtain seismic capacity curves of the buildings. The test results are available for the development or verification of a seismic evaluation model.
This paper uses ASCE 41-17 as the main evaluation model and is accompanied by a simplified pushover analysis, which can predict the seismic capacity curves of low-rise buildings in Taiwan. The predicted maximum base shear values for masonry-infilled RC buildings with openings and for RC buildings without masonry infill are, respectively, 69.69% and 87.33% of the test values. The predicted initial stiffness values are 41.04% and 100.49% of the test values, respectively. It can be seen that the ASCE 41-17 evaluation model is reasonable for the RC building without masonry infill walls. In contrast, the analysis result for the masonry infilled RC building with openings is more conservative than the test value because the ASCE 41-17 evaluation model is limited to masonry infill walls with an openings ratio not exceeding 40%. This study suggests using ASCE 41-17's unreinforced masonry wall evaluation model to simulate a masonry infill wall with an openings ratio greater than 40%. After correction, the predicted maximum base shear values of the masonry infilled RC building with openings is 82.60% of the test values and the predicted initial stiffness value is 67.13% of the test value. Therefore, the proposed method in this study can predict the seismic behavior of a masonry infilled RC frame with large openings.

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