

Integrated Approach in Analysis of Historical Ancient Monuments

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Abstract

Comprehensive analysis of seismic resistance of historical ancient monuments is an important aspect in rehabilitation of such structures. Most of them are made of stone blocks with dry joints and sometimes strengthened with metal connectors. Due to discontinuous nature and composition of the materials with significantly different properties, computational analyses of those structures are based on advanced numerical models with discrete or finite discrete element approach, and also knowledge of numerous material and structural parameters. A comprehensive approach to the analysis of such structures should integrate model updating, calibration and validation, as well as experimental investigations which may include testing of the material properties, complex non-linear static and dynamic tests and hopefully, shaking table testing of the structural model. This paper presents integration of the mentioned numerical and experimental investigations in analysis of the seismic resistance of Protiron monument, placed in the Diocletian Palace in Split, Croatia. The applied numerical model based on finite-discrete element method includes sliding of the blocks, fracture and fragmentation, cyclic behaviour, yielding and pulling out of the clamps and the bolts from the stone blocks [1]. Force-displacement relationship for clamps and bolts, obtained by static tests on several specimens, are used to calibrate the model of the metal connectors. Finally, shaking table testing of Protiron model was performed [2] in order to validate applied numerical model in dynamic regime and to provide an insight into the seismic resistance with detailed behaviour of the monument model.

References

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