On the Performance-Based Engineering Concepts for Historic Structures: Challenges and Expectations

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Abstract:

The development and application of performance-based engineering concepts in seismic design has been a primary focus of work in earthquake engineering during the last few decades. Although performance-based design and evaluation of masonry structures has been advanced, considerable effort is still required, for example in the application of the methods to historic masonry. Historic structures are of great importance to current and future generations as they convey historical and cultural aspects of past civilizations. Some of those structures have survived earthquakes for centuries while others collapsed, revealing our lack of knowledge concerning the seismic behaviour of such structures. Historic structures are typically massive and stiff and can be vulnerable to seismic events - even ones of low to moderate severity. The seismic vulnerability of such structures arises possibly due to the attraction of high inertial forces, the lack of ductility to dissipate seismic energy and/or the deterioration and weakening of the material over time. The seismic vulnerability of a structure is a function of the interaction of ground motion parameters and the structure itself. Here, we explore the seismic vulnerability of stone structures, strength and deformation, elastic moduli ratio, and damping mechanisms and ratios: all are needed to understand the seismic performance of historic structures.

DOI: 10.70803/001c.137895

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