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Resilient Analysis as an Alternative to Conventional Seismic Analysis Methods for the Maintenance of a Socioeconomical Functionality of Structures

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Abstract : Catastrophic events, such as earthquakes, are sudden, short, and devastating, threatening lives, demolishing futures, and causing huge economic losses. Current seismic analyses and design standards are based on life safety levels where only some residual strength and stiffness are left in the structure leaving it beyond economical repair. Consequently, it has become necessary to introduce and implement the concept of resilient design. Resilient design is about designing for ductility over time by resisting, absorbing, and recovering from the effects of a hazard in an appropriate and efficient time manner while maintaining the functionality of the structure in the aftermath of the incident. Resilient analysis is mainly based on the fragility, vulnerability, and functionality curves where eventually a resilience index is generated from these curves, and the higher this index is, the better is the performance of the structure. In this paper, seismic performances of a simple two story reinforced concrete building, located in a moderate seismic region, has been evaluated using the conventional seismic analyses methods, which are the linear static analysis, the response spectrum analysis, and the pushover analysis, and the generated results of these analyses methods are compared to those of the resilient analysis. Results highlight that the resilience analysis was the most convenient method in generating a more ductile and functional structure from a socio-economic perspective, in comparison to the standard seismic analysis methods.

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