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Seismic Fragility Functions of RC Moment Frames Using Incremental Dynamic Analyses

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Abstract : A capacity spectrum method (CSM), one of methodologies to evaluate seismic fragilities of building structures, has been long recognized as the most convenient method, even if it contains several limitations to predict the seismic response of structures of interest. This paper proposes the procedure to estimate seismic fragility curves using an incremental dynamic analysis (IDA) rather than the method adopting a CSM. To achieve the research purpose, this study compares the seismic fragility curves of a 5-story reinforced concrete (RC) moment frame obtained from both methods, an IDA method and a CSM. Both seismic fragility curves are similar in slight and moderate damage states whereas the fragility curve obtained from the IDA method presents less variation (or uncertainties) in extensive and complete damage states. This is due to the fact that the IDA method can properly capture the structural response beyond yielding rather than the CSM and can directly calculate higher mode effects. From these observations, the CSM could overestimate seismic vulnerabilities of the studied structure in extensive or complete damage states.

Keywords : seismic fragility curve, incremental dynamic analysis, capacity spectrum method, reinforced concrete moment frame
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