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Seismic Performance of Concrete Moment Resisting Frames in Western Canada

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Abstract : Performance-based seismic design concepts are increasingly being adopted in various jurisdictions. While the National Building Code of Canada (NBCC) is not fully performance-based, it provides some features of a performance-based code, such as displacement control and objective-based solutions. Performance evaluation is an important part of a performance-based design. In this paper, the seismic performance of a set of code-designed 4, 8 and 12 story moment resisting concrete frames located in Victoria, BC, in the western part of Canada at different hazard levels namely, SLE (Service Level Event), DLE (Design Level Event) and MCE (Maximum Considered Event) has been studied. The seismic performance of these buildings has been evaluated based on FEMA 356 and ATC 72 procedures, and the nonlinear time history analysis. Pushover analysis has been used to investigate the different performance levels of these buildings and adjust their design based on the corresponding target displacements. Since pushover analysis ignores the higher mode effects, nonlinear dynamic time history using a set of ground motion records has been performed. Different types of ground motion records, such as crustal and subduction earthquake records have been used for the dynamic analysis to determine their effects. Results obtained from push over analysis on inter-story drift, displacement, shear and overturning moment are compared to those from the dynamic analysis.

Keywords : seismic performance., performance-based design, concrete moment resisting frame, crustal earthquakes, subduction earthquakes
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