A Case Study on the Collapse Assessment of the Steel Moment-Frame Setback High-Rise Tower

Authors : Marzie Shahini, Rasoul Mirghaderi

Abstract : This paper describes collapse assessments of a steel moment-frame high-rise tower with setback irregularity, designed per the 2010 ASCE7 code, under spectral-matched ground motion records. To estimate a safety margin against life-threatening collapse, an analytical model of the tower is subjected to a suite of ground motions with incremental intensities from maximum considered earthquake hazard level to the incipient collapse level. Capability of the structural system to collapse prevention is evaluated based on the similar methodology reported in FEMA P695. Structural performance parameters in terms of maximum/mean inter-story drift ratios, residual drift ratios, and maximum plastic hinge rotations are also compared to the acceptance criteria recommended by the TBI Guidelines. The results demonstrate that the structural system satisfactorily safeguards the building against collapse. Moreover, for this tower, the code-specified requirements in ASCE7-10 are reasonably adequate to satisfy seismic performance criteria developed in the TBI Guidelines for the maximum considered earthquake hazard level.

Keywords : high-rise buildings, set back, residual drift, seismic performance

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020