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Collapse Capacity and Energy Absorption Mechanism of High Rise Steel Moment Frame Considering Aftershock Effects

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Abstract : Many structures sustain damage during a mainshock earthquake but undergo severe damage under aftershocks following the mainshock. Past researches have studied aftershock effects through different methodologies, but few structural systems have been evaluated for these effects. Collapse capacity and energy absorption mechanism of the Special Steel Moment Frame (SSMF) system is evaluated in this study, under aftershock earthquakes when prior damage is caused by the mainshock. A twenty-story building is considered in assessing the residual collapse capacity and energy absorption mechanism under aftershock excitation. In addition, various levels of mainshock damage are considered and reflected through two different response parameters. Aftershock collapse capacity is estimated using incremental dynamic analysis (IDA) applied following the mainshock. The study results reveal that the collapse capacity of high-rise structures undergoes a remarkable reduction for high level of mainshock damage. The energy absorption in the columns is decreased by increasing the level of mainshock damage.

Keywords : seismic collapse, mainshock-aftershock effect, incremental dynamic analysis, energy absorption
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