

Seismic design modification factors for steel special moment-resisting frames

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ABSTRACT

This paper summarizes a study focused on evaluating the design modification factors (i.e., R , C_d , Ω) for Steel Special Moment-resisting Frames (SSMFs) by application of the FEMA P695 methodology. In this study, archetype design that comprise 3-bay special SMFs that serve as lateral load resisting system of steel buildings ranging from 1 to 20 stories are designed using ASCE 7-05 and AISC 341-05 design provisions. Nonlinear models are developed using latest advances in structural component modeling. Parameters for these models are extracted from a steel component database for modeling of component deterioration. The numerical models are analyzed to predict the collapse capacities of each design, and the adjusted collapse margin ratios (ACMR) are evaluated and compared to acceptance criteria. It was found that SMFs designed in accordance with present seismic provisions provide an acceptable margin of safety with the exception of a performance group that contains tall moment resisting frames designed for high seismic zones using the response spectrum analysis procedure. It was also found that increasing the Column-Beam Moment ratio from the minimum code requirement of 1.0 to a larger value can significantly improve long period SMFs behavior leading to an acceptable ACMR values.