DAMAGE ESTIMATION OF 3-STORY STEEL BRACED FRAME WITH KHORJINI CONNECTIONS AND INFILL WALLS FOR TEHRAN

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Connection failure of extremely large number of steel buildings with semi-rigid connections, known as “Khorjini”, has been reported in the past major earthquakes in Iran. In such connections, continuous beams cross columns with partially bending moment transferring capability. Considering this fact, a typical 3-story steel braced building with “Khorjini” connections and brick infill walls is selected where incremental dynamic analysis (IDA) is employed to investigate its performance. As a result, analytical fragility curves are derived to calculate the probability of exceeding certain designated performance limits for some probable earthquakes expected for Tehran.

For this selected structural typology, site inspections took place, as-built drawings were studied and overall specification (i.e. common number of stories, beam, column and bracing sections, connection details and dimensions of infill walls, etc…) for such structures was concluded. Accordingly, three-bay (span’s length 5.0m) buildings with three storeys (story height 3.2m) have been considered (Figure 1).

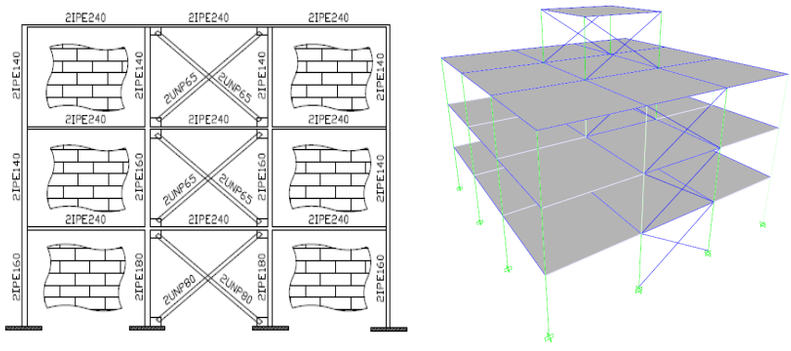

Figure 1. Schematic view of 3 story building model

In order develop fragility curve, 44 records as offered by ATC-63 are used to perform nonlinear analysis on the building model as created on Opensees software. In order to estimate the capacity and the demand curves, built steel sections, lateral systems, infill modelling and a recent Probabilistic Seismic Hazard Analysis (PSHA) results are studied. IDA results are employed to plot fragility curves at some designated performance limits (i.e. Immediate Occupancy (IO), Life Safety (LS) and Collapse Prevention (CP) limit states) which showed 83% probability of exceeding at CP performance level for earthquakes with a return period of 2475 years. This probability for return period of 475 years is estimated as 17% (Figure 2).

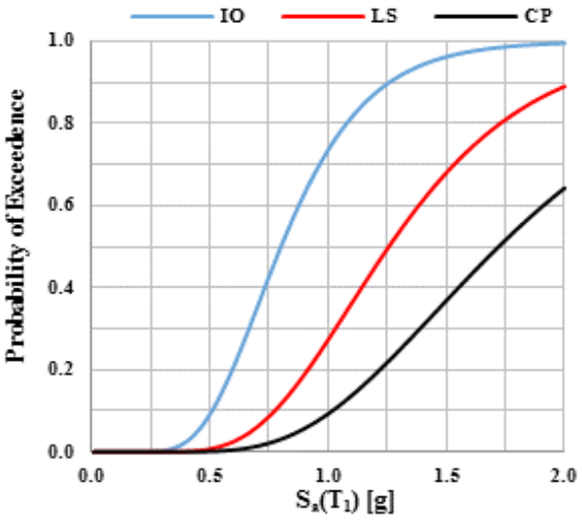

Figure 2. Fragility curves of 3-story steel braced building with "Khorjini" Connections and infill wall

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