

## Concurrent Hazard Fragility Analysis with Consideration of Structural Uncertainties

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**Abstract :** In this paper, the fragility analysis of earthquake-strong wind concurrent hazards considering structural uncertainties was conducted. Eleven sets of structural uncertainty parameters were considered, and random structural models were generated using Latin hypercube sampling. The uncertainties in seismic ground motion and wind load inputs were incorporated, and the conditional failure probability of the structures was calculated. A 12-story concrete building was used as an example, with the IDR (Inter-story Drift Ratio) as the performance indicator. The failure probabilities under individual and multiple hazards were compared, along with a comparison of fragility analysis results with and without considering structural uncertainties. The numerical simulations show that including structural uncertainties increases the structural failure probability by 20%. The peak stress and strain of core-restrained concrete, the structural damping ratio, and the peak stress of unrestrained concrete are found to be decisive factors in the structural response.

**Keywords :** structural uncertainty, incremental dynamic analysis, multi-hazard fragility, latin hypercube sampling

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