
Simplified Fragility Evaluation Method for RC Piers

George Vulpe MINESAWA, Kazuhiko URANO, Tsuyoshi NISHIMURA, Ikumasa YOSHIDA

For the analysis of the seismic risk, the structural fragility analysis method helps quantifying the effect of the uncertainty associated with the variability of structural materials and foundation soil parameters. Fragility analysis for a typical RC bridge pier structure is performed by FEM nonlinear analysis including the effect of the foundation soil flexibility. Typical fragility analysis involves analysis of the structural response with a large number of parameters combinations generated through Monte Carlo Simulation (MCS). The effect of parameter variability on structural response and structural safety is being assessed.

A faster fragility evaluation method named Simplified Fragility Evaluation Method is proposed herein for the simplification and the speed-up of the structural fragility evaluation, by computing the effect of the structural parameters variability on the structural response at one loading level and extrapolating the response at other loading levels by using as reference the load-displacement structural response computed for the characteristic values of parameters. Proposed fragility evaluation method's computational efficiency is compared with that of equivalent fragility determined by the Monte-Carlo method.