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論文審査の要旨及び審査員

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論文審査の要旨（2000 字程度）

The doctoral thesis entitled "Response Evaluation and Seismic Collapse Assessment of Base-isolated RC Buildings" has the objectives to (i) investigate the influence of bidirectional excitation under design earthquake (DE) level and risk-targeted maximum considered earthquake (MCE_R) level shaking on base-isolated buildings, (ii) evaluate the performance of base-isolated buildings considering fling-step and forward-directivity effects of near-fault ground motions, (iii) perform the probabilistic collapse assessment of base-isolated buildings with and without pounding, (iv) perform the cost analysis of base-isolated buildings due to damage to structural and non-structural components, service equipment and downtime, and (v) assess the effects of vertical excitation and lead core heating on the evaluation of isolator displacement demands. The contents of the thesis are summarized as follows:

Chapter 1 - Introduction: Background and motivation of the research, a detailed literature review of previous related studies, and research objectives are discussed.
Chapter 2 - Response evaluation of base-isolated buildings under bidirectional excitation: The superstructure response of 4-, 8-, and 12-story base-isolated buildings under DE-level and MCE_R-level near-fault and far-fault ground motions are investigated and a comparison is done with their fixed-base counterpart. Three dimensional finite element models of the buildings are created considering nonlinearities in the isolation system and the superstructure. Results of the nonlinear response history analysis indicate significant reduction in the response of the base-isolated buildings compared to fixed-base buildings. It is also observed that there is no structural damage under DE-level near-fault and far-fault motions and for MCE_R-level far-fault motions, whereas minor structural damage is predicted under MCE_R-level near-fault motions.
Chapter 3 - Influence of fling-step and forward-directivity effects of ground motions on base-isolated buildings: The effects of the pulse-type behavior of fling-step and forward-directivity ground motions on the behavior of 10-story base-isolated buildings with and without shear walls is evaluated under DE-level and MCE_R-level excitations. Analyses are also carried out for artificial pulses. It is determined that the superstructure response is larger for ground motion with forward-directivity characteristics, but when artificial pulses are used fling-step pulses result in a larger response compared to that of forward-directivity pulses.
Chapter 4 - Probabilistic collapse assessment and cost analysis of base-isolated RC buildings with shear walls: Incremental dynamic analysis is carried out on three dimensional models of 10-story base-isolated buildings with and without shear walls. Fragility curves are obtained and the collapse margin ratio, mean annual frequency of collapse and probability of collapse in 50 years period are calculated. It is found that the use of shear walls increase the resistance of the buildings against collapse. Additionally, the calculation of financial losses due to damage to structural and nonstructural components, service equipment and downtime is carried out, which shows that the building with shear walls result in larger repair costs and downtime costs compared to the building without shear walls.
Chapter 5 - Probabilistic collapse assessment of base-isolated RC buildings considering pounding with a moat wall: The effects of pounding on the seismic collapse assessment of 10-story base-isolated buildings with and without shear walls is investigated, by carrying out incremental dynamic analysis. It is found that pounding is less likely to occur even under MCE_R-level ground motions. The mean annual frequency of collapse and probability of collapse in 50 years period is determined to be 1.3 times larger for a building without shear walls compared to a building with shear walls. Pounding results in a reduction of the resistance of the buildings against collapse compared to no pounding case.
Chapter 6 - Influence of vertical ground motion and lead core heating on isolator displacement demands: Isolator displacement demands imposed by near-fault and far-fault ground motions considering the effects of vertical excitation and lead core heating are assessed and the efficacy of the equivalent lateral procedure of the ASCE 7 standard is evaluated. The superstructure is assumed to be rigid. It is determined that the ELF procedure provides conservative estimates of the isolator displacement demands for far-fault ground motions; however, for near-fault ground motions, the displacements demands are underestimated considering the effects of vertical excitation and lead core heating.
Chapter 7 - Conclusions and recommendations: Conclusions of the research which will be useful in improving design guidelines and also highlight the importance of collapse assessment in evaluating the performance of the base-isolated buildings are presented. Recommendations for future research are outlined.

This study provides significant contributions to the advancement of knowledge in the field of Structural Engineering and Earthquake Engineering. Therefore, this thesis is considered sufficient for the degree of Doctor of Philosophy.