
Dynamic Response Properties of a Base-Isolated Building during Seismic Motions of the 2011 off the Pacific Coast of Tohoku Earthquake

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JSSI's findings reported the example of a base-isolated building where a lead damper and steel material damper that constituted the isolation device were damaged, and the problem in the structural design of the isolation device that received long-time repetition amplitude caused by the large-scale earthquake was clarified.

Therefore, to examine the influence of the characteristics of input motions on the dynamic responses of a base-isolated building, we performed parametric studies by a 2-mass system model using the representative strong ground motion records, K-NET Mito (IBR006) and K-NET Furukawa (MYG006). We showed the influences that induced the response displacements of the isolated floor and response accelerations of the superstructure, due to the characteristics of input ground motions under different ground conditions.

In addition, the cumulative damage ratio of the isolation device was evaluated by Miner's law, and we calculated the frequency distributions of the repetition amplitude of the relative displacements of the isolated floor using the Rain Flow Algorithm. The results revealed the cumulative damage ratio by MYG006 was 40 times larger than the IBR006 value. Therefore, it is very important to consider the characteristics of seismic ground motion in the structural design of a base-isolated building.