Seismic response analyses of 10-story RC building and installed furniture

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NIED has been developing a numerical simulation software named E-Simulator, which aims at reproducing damage and collapse behavior of civil and building structures and indoor damage against large earthquakes; data obtained from E-Defense shake-table tests are used for its validation. Numerical codes are developed separately for structures and non-structural components because different types of models are employed; structures such as steel frame, reinforced concrete (RC) frame and so on are modeled mainly by using solid elements[1], and non-structural components such as furniture, medical equipment, ceilings and so on are modeled by using linear Timoshenko beam elements incorporating the adaptively shifted integration (ASI)–Gauss technique[2].

In this study, using these two numerical codes, seismic response analysis of the 10-story RC building, which was tested at E-Defense shaking table in FY2015, and motion analysis of the furniture virtually installed on each floor, are conducted. For the structural analysis, acceleration data measured on the shaking table during the excitation of JMA Kobe earthquake record is applied on the bottom of the base. To transmit vibration from the structure to the installed furniture, acceleration data on the slabs and walls, on which the furniture is located and may contact, are obtained from the result of the structural analysis and used as a boundary conditions of the motion analysis of the furniture. As a result of the analyses, it is observed that the structure is damaged severely in the lower stories and the pieces of furniture in the upper stories are overturned.

References

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