

Simulation analyses for shaking table tests of base-isolated buildings with buckling of laminated rubber bearings

It is known that lateral restoring force of laminated rubber bearings deteriorates and buckling fracture occurs in them when bearings are subjected to lateral deformation that far exceed their design level under compressive loads. This paper proposes a time history response analysis method that can predict the ultimate behavior of base-isolated buildings stemming from such buckling fracture in laminated rubber bearings. In this method, bearing characteristics are represented by a macroscopic mechanical model that is expanded by adding an axial spring to an existing model. Nonlinear spring characteristics are used for its rotational spring and shear spring, and the central difference method is applied to solve the equations of motion. In order to verify the validity of the method, simulation analysis of shaking table tests of a base-isolated structure model was conducted. The results of the simulation analysis agree well with the test results. The proposed method can express the buckling behavior of bearings in the large deformation range, and is effective as a technique to predict the ultimate behavior of base-isolated buildings caused by buckling fracture in bearings.