Seismic Response Analysis of a High-Rise-Building with Seismic Isolation Rubber

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Abstract: Seismic isolation laminated rubber is used as an effective means for suppressing damage to buildings and people in buildings by earthquakes. The restoring-force characteristic of the rubber has non-linerar-vibration characteristics which depend on the displacement amplitude. PFT-ELS (Equivalent linear system using the restoring force model of power function type) has been applied for calculating approximate responses of various non-linear-vibration systems [Kazuhito, M., et al. (1994); Koichi, S., et al. (1995); Koichi, S., et al. (1996)]. The authors have also applied to optimize the non-linear vibration characteristics of the isolation rubber using PFT-ELS and GA [Ayumi, T., et al. (2017)]. However, since PFT-ELS does not express the histerisis loop itself, there was a problem in analysis accuracy. As a result, it is considered that the optimum solution of the seismic isolation rubber is affected even when it is applied to the seismic isolation structure. Therefore, in this research, a restoring force model expressing the historical restoring force curve for each displacement amplitude is constructed, and PFT-HYS (Hysteresis system using the restoring force model of power function type) which directly solves the model by applying it to the equation of motion is applied. Then, we compare it with the seismic response analysis result of the base isolation structure applying PFT-ELS and consider the effectiveness of each method.

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