Application of continuous column concept to morphogenesis of super-high-rise building and large spatial structure

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Abstract

Application of the continuous column concept [1] to morphogenesis of super-high-rise building and large spatial structure is investigated in this study. The continuous column effect is defined as the phenomenon in which, as the flexural stiffness of continuous columns or walls in multistory building increases, drift distribution over structural height becomes more uniform when subjected to earthquake ground motions. In the past research [2], in order to evaluate the continuous column effects in various framing types quantitatively, inelastic dynamic time-history analyses were carried out for the coupled shear-flexural-beam model, in which lumped mass and spring model is connected to continuous column. Recently, this continuous column concept is applied to the design proposal of a super-high-rise building [3] as shown in Figure 1. Here, many partially-continuous columns are installed to provide the structural continuity, flexibility of floor planning and asymmetric overall configuration. This design work won the award of excellence in the 2017 Architectural Institute of Japan annual meeting. Also, the continuous column concept is applied to the design proposal of large spatial structure as shown in Figure 2. This stadium consists of continuous columns, wooden moment-resisting frames, and membrane roof. In ordinal times, continuous columns support membrane roof. At earthquakes, continuous columns are expected to exert continuous column effects to mitigate the drift concentration in the wooden moment-resisting frames.

Figure 1: Design of super-high-rise building

Figure 2: Design of large spatial structure

References

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