Seismic Performance Evaluation of Twisted Braced Tube Systems

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Summary

One of the distinguished features of the complex-shaped tall buildings adopting the braced tube system is the twisted angle of their bracings.The seismic responses of the complex-shaped tall buildings are examined as the planar twisted angle of the diagonal members varies. Six of sixty story building models with different angle conditions and different seismic loading conditions are assumed.In a high seismicity area, it is found that the angle of twist is an important factor that affects the base shear and story drifts.

Keywords:CTB; diagonal brace; tube structure; twisted angle; base shear; story drift.

1. Introduction

A relatively new tall building design trend called complex-shaped tall buildings (CTB's) was initiated from the late of the 20th century and is continuously employed up to date. The most remarkable feature of CTB's is that they are tapered; twisted and tilted in shape. Various structural systems have been considered and developed to satisfysuch design requirements. The simple and widely used structural system such as steel moment frames turned out to be inefficient for CTB's. As a lateral resisting element, diagonal braced members areused successfully, as they are shown in John Hancock Building. CCTV headquarters building in Beijing is a typical example of CTB using the braced tube structure as a lateral resisting system[1].However, it is obscure to perform the seismic evaluation of CTB's using braced tube system because no applicable standard has been established so far[2]. As the high-rise buildings in complex shapes adopting braced tube systems become popular, there rises the requirement of the clear design and the evaluation methods for the seismic load.

In this study, focusing on the twisted shape of a typical CTB, the authors would like to find the effects of the angle of twists to the seismic loads. Six of the 60 story buildings with brace tube system are assumed to be located at the strong earthquake area and the moderate earthquake area. The seismicevaluations are performed as the twisted angle of brace tube varies to see the changes of base shears, and story drifts.

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