



Structural Planning for Tall Damped Building with Irregularly-Shaped Plan and Elevation

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Abstract

This paper introduces two distinctive means for use of a 189-meter-high damped structure ensuring the safety against earthquake.

1. Realization of L-shaped elevational structure planning

The bottom and top of the tower have belt trusses and hat trusses respectively to restrain the bending deformation. Furthermore, large-capacity oil dampers (damping force 6,000kN) are installed in the middle part of the tower to restrain the higher-mode deformation.

2. Realization of L-shaped planar structure planning

We devised the means of matching the centers of gravity and rigidity by adjusting planar rigidity. Moreover, viscous damping devices are located at the edges of the L-shaped plan, where torsional deformation tends to be amplified. We call this system “Damping Tail” system.

Keywords: “ Damping Tail” system; high-capacity oil damper; hat truss and belt truss

1 Introduction

In recent years, skyscrapers with bizarre planar/elevational shapes have started to emerge worldwide. Demands for large-scale, complicated shaped skyscrapers are on the increase in Japan which has been hit by large-scale earthquakes during recent years. On the other hand, these types of buildings are likely to have larger deformations and stresses caused by horizontal loads due to an earthquake or strong wind than regular-shaped buildings and therefore require a variety of considerations and cares in the designing process.

In this project in Osaka, we have focused especially on two planning processes: the elevational structure planning of a high-rise (tower) section, the planar structure planning of a

low-rise (podium) section, and thus secured the safety of a complicated shaped skyscraper in an efficient way. This paper describes the details of the process.



Figure 1. Concept rendering of completed building