

A DESIGN OF TALL BUILDING with SEMI-ACTIVE BASE-ISOLATION SYSTEM

S05: JAE Special Session
S05-01:
Spectacular Projects of
Base-Isolated Buildings

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1. INTRODUCTION

The authors have undertaken many projects in which the base-isolation structure was used not only to improve the seismic performance, but to also allow a more flexible architectural planning.



Fig. 1 south view

2. Outline of building

The super-walls provide visual integration, as well as acting as coupled shear walls of RC wall columns (wall thickness 640mm, width about 9m) connected by connecting beams, arranged as seismic elements in the short direction over the entire height of the two end surfaces. In the long direction, the structure consists of a steel braced frame using the boundary area between the low-rise floors core and the large spaces. The super-walls on the two end surfaces are connected by the core frame, forming a large I-shaped structure in plan, increasing the stiffness and seismic resistance of the building.

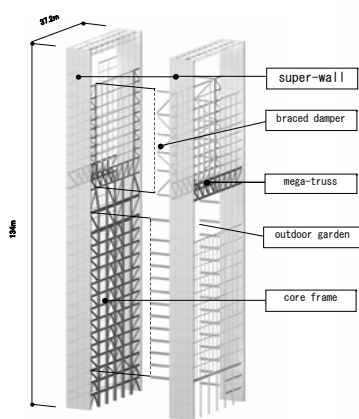


Fig. 2 Structural frame

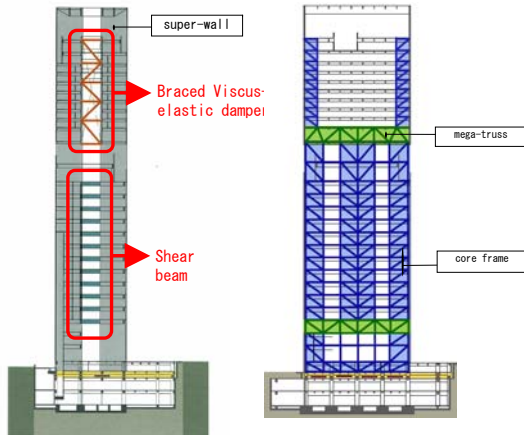


Fig. 3 Outline of the structural system

3. Overview of semi-active base-isolation system

The base-isolation system for this building consists of 55-rubber bearings and 24-oil dampers. Half of them are variable oil dampers and the rest are passive oil dampers. The variable oil dampers are able to switch the damping coefficient between two stages. The sensors constantly observe the upper structure sway, and the observed displacement of the seismic isolation story, the upper structure acceleration and the ground acceleration are transmitted instantly along the connecting cables to the controller. In the event of an earthquake, the controller puts the ideal control signals, in accordance with pre-programmed control rules, to switch the damping coefficient of the variable oil dampers.

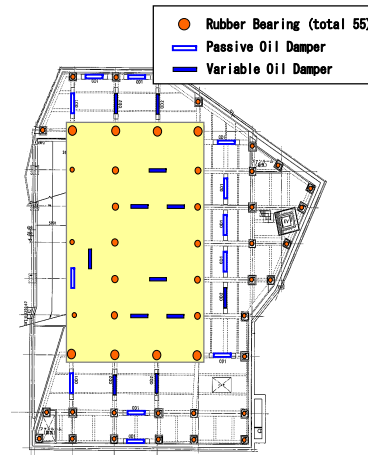


Fig. 4 Layout diagram of the base isolation level

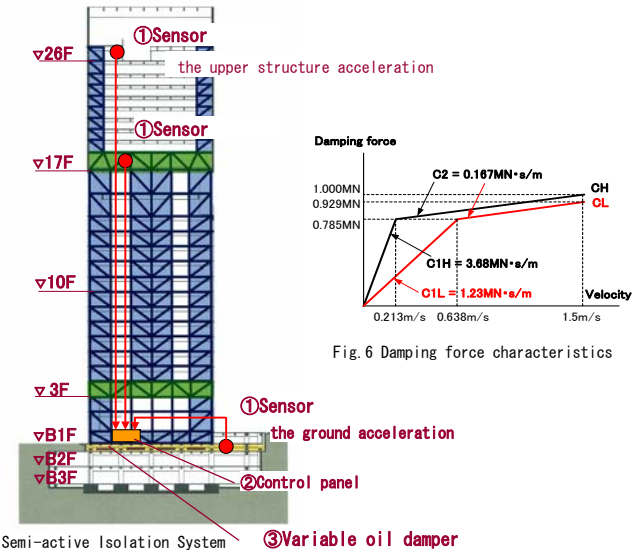


Fig. 5 Semi-active Isolation System

Fig. 6 Damping force characteristics

4. SUMMARY

The merits of base isolated structures in highly seismic Japan are not only the improvement in seismic performance, but it also provides potentially large benefits for design and urban landscape.

